

APPENDIX 2
COLLABORATIVE CONSERVATION
STRATEGIES FOR THE LESSER PRAIRIE-
CHICKEN AND SAND DUNE LIZARD IN
NEW MEXICO

Findings and recommendations of the New Mexico
LPC/SDL Working Group

The New Mexico
LPC/SDL Working Group

August 2005

(This page intentionally left blank)

Executive Summary

After more than two years of negotiations, a broad strategy for the protection of two at-risk species in southeastern New Mexico has been agreed to by state and federal agencies, ranchers, oil and gas industry representatives, and conservation interests. This document presents the findings and recommendations of the New Mexico LPC/SDL Working Group, a multi-party group of stakeholders with interests in conservation management and land use decisions regarding two candidate species for federal listing under the Endangered Species Act: the Lesser Prairie-Chicken (LPC) and Sand Dune Lizard (SDL). One of the first achievements of its kind addressing multiple candidate species, this report outlines a comprehensive approach for reducing biological threats while affirming and protecting economic values and traditional land uses. It applies across a large region including portions of Quay, De Baca, Curry, Chaves, Roosevelt, Eddy, and Lea counties.

Candidate Species and the Southeast New Mexico Working Group

The LPC is a prairie grouse species native to the southern Great Plains, including parts of Colorado, Kansas, New Mexico, Oklahoma, and Texas. The SDL is a lizard species native to a small area of southeastern New Mexico and west Texas. As candidate species, both have been ruled warranted for listing as threatened or endangered by the U.S. Fish and Wildlife Service. Central concerns for both species are the loss, fragmentation or alteration habitat.

Concerned over the status of the two species, state and federal agencies and the Wildlife Management Institute proposed in late 2002 that a “Working Group” of appropriate public and private stakeholders begin meeting to devise a collaborative conservation strategy. Following a period of formal status assessment and recruitment, the Working Group began meeting in January 2003 under the guidance of a professional facilitation team. **The goal statement adopted by the Working Group was:**

To create a conservation strategy for the management of shinnery oak and sand sage grassland communities in southeastern and east-central New Mexico, recommending a range of specific actions to enhance and secure populations of Lesser Prairie-Chickens and Sand Dune Lizards, so that federal or state listing of these species is not needed, while protecting other uses of the land.

To design a consensus strategy aimed at protecting both vulnerable species and human livelihoods, representatives had to reach a high level of shared understanding regarding the biology of the two species. Equally important, stakeholders had to develop a knowledge of and concern for each other’s economic and other interests, particularly in the context of how these might be affected by any proposed conservation action. Shared understandings were achieved by thorough review and discussion of scientific and management literature, and months of communication between the affected parties.

Lesser Prairie-Chicken

“Sand shinnery” communities, dominated by dwarf shinnery oak and grasses, constitute the majority of LPC habitat in southeastern New Mexico. The life cycle of the LPC revolves around the social groupings known as leks, and mating display areas known as lek sites. Although located in open areas, lek sites can exist only where suitable tall grass and shrub cover for nesting, brood-rearing, and winter feeding can all be found in fairly close proximity. Quality nesting habitat is thought to be the primary driver of LPC population growth or decline.

Climatic variation on seasonal, annual, or longer timescales is an important determinant of habitat quality for LPCs in New Mexico. Population increases associated with above-average rainfall in the 1980s were followed by a steep downward trend in the dry 1990s. Livestock grazing also plays a major role in determining habitat quality. Heavy grazing may reduce or eliminate residual tall grass cover needed for nesting, particularly in years of low rainfall. Habitat quality may also be reduced by the spread of mesquite or other shrubs, and by improper or excessive use of herbicides for shinnery oak control.

Overall LPC population size and geographic range have been greatly reduced since the 1800s due to the widespread conversion of native prairie grasslands to agricultural uses. LPC populations still contend with habitat loss and fragmentation due to various forms of development and changing land uses. Conversion of rangeland habitat to irrigated agriculture continues in some areas of east-central New Mexico. Roads and infrastructure development associated with the oil and gas industry have led to reductions in usable habitat, particularly in the southeast. Such impacts are heightened by the LPC’s tendency to avoid nesting near areas of human activity or large structures.

The planning area has been classified into three management regions, based on LPC population status (see Map 3). These follow a general north-south pattern, and include a Sparse and Scattered Population Area (SSPA) where leks are present in low numbers and isolated from one another, a Primary Population Area (PPA) where over 90% of the state LPC population resides, and an Isolated Population Area (IPA) in the south where a single known lek and small scattered groups of birds remain.

Sand Dune Lizard

Distribution of the SDL is restricted to sand dune habitat in Lea, Eddy and south Chaves counties. The SDL occurs only in large and deep sand dune "blowouts" (open, low-lying areas between active dunes) in areas dominated by shinnery oak. SDL populations may be threatened by activities that remove shinnery oak, or otherwise alter the configuration of shrub and grass cover and blowout patches in dune areas. The two main threats faced by the SDL are the removal of shinnery oak by herbicide application, and disturbance of dune areas by roads and infrastructure from activities such as oil and gas development.

Land uses and economic interests

Ranching

Ranching is the predominant land use in sand shinnery habitat in New Mexico. Livestock grazing contributes significantly to the regional economy, and area ranchers have expressed a

strong interest in avoiding the need for federal listing of species. Most ranches include both private land and federal or state allotments. The loss or severe restriction of a grazing permit may result in an entire operation becoming no longer viable, and also affects property values. Thus the Working Group recognizes that ranchers who voluntarily adopt grazing practices intended to benefit at-risk species should receive appropriate economic compensation, as well as protection from future additional regulatory burdens in the event of listing.

Oil and Gas

The planning area of southeastern and east-central New Mexico is also one of the major petroleum-producing regions of the United States. Across the area roughly 10,000 people are directly employed in oil and natural gas extraction, and some 23,000 are employed in related occupations. Much of the economic well-being of this region is tied to the employment, royalties, and taxes generated by petroleum production. Land management decisions that restrict or preclude full mineral development of certain state and federal lands thus affect the flow of revenues into local and state economies.

Conservation Recommendations

Lesser Prairie-Chicken Strategies

Working Group strategies for the LPC are divided into nine “pathways” focusing on different types of conservation or management actions. Pathways 1-5 present sets of recommendations designed to address all major categories of threat facing the species. Pathways 6-9 describe support strategies for on-the-ground efforts. In addition to the three management regions listed above, the Working Group recognizes the existing Roswell Bureau of Land Management (BLM) Core Management Area (CMA) for the LPC. These four geographic units reflect important differences not only in species conservation status, but also in patterns of land use and surface ownership.

Pathway 1 addresses the need to maintain quality rangeland habitat for nesting and brood-rearing, and presents specific standards for evaluating habitat quality. Key recommendations include:

- Establishment of a coordinated program of financial compensation for ranchers who choose to manage grazing or undertake other actions to improve LPC habitat.
- Project funding and coordination for reversing mesquite encroachment in sand shinnery habitat.
- Limited use of herbicide to remove shinnery oak only when certain specified criteria are met.
- Measures to enhance habitat quality in Conservation Reserve Program (CRP) fields including the planting of native grasses.

Funding for all of these strategies may be available through the Environmental Quality Incentives Program (EQIP) and several other existing state and federal programs.

Pathway 2 addresses the loss or fragmentation of habitat that may be a consequence of energy development activities. This pathway presents an innovative set of guidelines for

managing new mineral leasing and development in the PPA, based on sophisticated mapping and habitat analysis. Key recommendations for the PPA include:

- Deferral of new mineral leasing in suitable and occupied habitat, while allowing continued leasing in other areas.
- Coordinated tracking of changing acreages in each habitat category over time.
- Guidelines for lifting lease deferrals in exchange for increases in suitable or occupied habitat, whether due to reclamation efforts or other factors.

Guidelines for protecting occupied habitat in the SSPA and IPA are also presented, as are strategies for minimizing impacts of new mineral development. These include the use of negotiated conditions of approval and plans of development on federal leases, and timing and noise stipulations as needed. Pathway 2 also contains specific recommendations for minimizing surface disturbance and carrying out site reclamation.

Pathway 3 describes various means by which important areas can be maintained and managed as LPC habitat. Principal elements include:

- Consolidation of BLM property in its Roswell CMA, through land exchanges with the New Mexico State Land Office, to help direct future development outside of suitable habitat.
- Recommendations for a comprehensive management plan for the New Mexico Department of Game and Fish-administered Prairie-Chicken Areas.
- Establishment of five new LPC reserve areas, two in the IPA and three in the SSPA. Each would be 4 square miles or larger, on lands purchased from willing sellers or secured long-term lease agreements, or by dedication of public lands.
- Establishment of Candidate Conservation Agreements with Assurances (CCAAs) to encourage conservation efforts on non-federal lands by offering protections from future regulatory requirements.

Pathway 4 focuses on long-term planning for re-establishing LPC populations in the southern portion of the range (the IPA). Strategy elements include:

- Analysis and prioritization of remaining potential habitat areas. Low priority areas would be removed from consideration from special management, while high priority areas may form the building blocks for future reintroduction sites.
- Establishment of a captive breeding and LPC reintroduction program in southeastern New Mexico. A captive propagation facility near Carlsbad would provide a source population for reintroducing birds to unoccupied parts of the historic range, including Department of Energy lands at the Waste Isolation Pilot Project facility.

Pathway 5 presents additional measures for boosting LPC populations by directly targeting specific causes of mortality or low nesting success. Strategies include:

- Limited use of predator control to reduce mortality in isolated lek areas.
- Management and education efforts to reduce poaching and accidental shooting.

- Road closures and other management to limit disturbance by off-road vehicles.
- Limited grain crop plantings for leks in isolated areas with poor habitat quality.

Pathway 6 outlines research and monitoring needs, including specific recommendations for LPC surveys and habitat monitoring. It also discusses criteria by which overall success of conservation efforts may be evaluated. **Pathway 7** discusses strategies for conservation education and outreach. In **Pathway 8**, the group recommends that a position of “Eastern Plains Conservation Coordinator” be established and funded, with responsibilities to coordinate and facilitate the implementation of strategies for the LPC and SDL. This would include working with landowners, seeking to initiate partnership projects, and seeking funding from a variety of sources as described in **Pathway 9**.

Sand Dune Lizard Strategies

Various elements of the LPC conservation pathways apply equally to the SDL, including strategies for education and outreach, coordinating implementation, generating funding, and securing landowner protections through CCAAs. Beyond these, specific conservation recommendations for the SDL include:

- Cessation of herbicide spraying to remove shinnery oak within 500 meters of occupied or suitable SDL habitat;
- Maintenance of dispersal corridors of unsprayed shinnery oak between dune areas less than 2000 meters apart;
- No new oil or gas wells within 100 meters of sand dune areas in suitable or occupied SDL habitat;
- Well density not exceeding 13 per square mile in suitable habitat areas.

Additional recommendations are made for minimizing impacts of existing development, use of “thumper trucks” for seismic exploration, and off-road vehicles.

The final chapter of this document announces closure of the strategic planning efforts of the Working Group, and the formation of an Implementation Team to move collaborative conservation efforts forward into a new phase of operational planning and project implementation. A number of significant conservation actions on behalf of the LPC and SDL are already under way. These represent a significant first step toward reducing threats faced by the two species.

Table of Contents

Executive Summary	ii
Chapter One: The Species and the Working Group	1
1.1 Introduction.....	1
1.2 Formation and membership of the Working Group.....	3
1.3 Goal statement of the Working Group.....	5
1.4 Working Group principles and philosophy.....	5
1.5 History and process of negotiation	6
Chapter Two: The Planning Area	8
2.1 The ecological context: shinnery oak and sand sage grasslands of SE New Mexico.....	8
2.2 The economic context: ranching interests.....	9
2.3 The economic context: oil and natural gas interests	10
2.4 Land ownership and use.....	12
Chapter Three: Species Biological Background and Conservation Status	13
3.1 LPC distribution and status	13
3.2 LPC species ecology, life history and population dynamics	14
3.3 LPC habitat requirements	16
3.4 Threats to the LPC in New Mexico	20
3.5 SDL distribution and status.....	25
3.6 SDL species ecology, life history and population dynamics	26
3.7 SDL habitat requirements	26
3.8 Threats to the SDL in New Mexico	26
3.9 Endangered Species Act considerations	28
Chapter Four: Lesser Prairie-Chicken Conservation Strategy.....	31
Introduction.....	31
4.1 Strategy orientation: conservation pathways	31
4.2 Planning regions and management priorities based on population status.....	32
4.3 Landscape analysis.....	33
4.4 Prerequisites for stakeholder support and implementation.....	35
4.5 Objectives for the conservation strategy.....	36
Pathway 1: Increase habitat quality and LPC recruitment on rangelands and CRP lands	38
Pathway overview: Opportunities and challenges	38
Definitions and standards.....	39
Conservation Strategy 1.1: Conservative grazing management in important habitat areas, with compensation for ranchers	40
Conservation Strategy 1.2: Enhanced CRP management	43
Conservation Strategy 1.3: Mesquite control	45
Conservation Strategy 1.4: Shinnery oak management.....	46

Pathway 2: Minimize habitat loss and modification due to energy development.....	48
Pathway overview: Opportunities and challenges	48
Definitions and standards.....	50
Conservation Strategy 2.1: Recommended guidelines for new mineral leasing	52
Conservation Strategy 2.2: Minimizing impacts of new and ongoing energy development	59
Conservation Strategy 2.3: Coordinating restoration and reclamation of developed areas ..	60
Pathway 3: Consolidate and expand network of reserves and other areas managed for LPC conservation.....	62
Pathway overview: Opportunities and challenges	62
Conservation Strategy 3.1: Land and mineral exchanges to consolidate federal holdings in BLM core management areas.....	63
Conservation Strategy 3.2: Options for acquiring or designating lands for LPC reserves ...	64
Conservation Strategy 3.3: Develop and implement a comprehensive management plan for the PCAs	67
Conservation Strategy 3.4: Develop Candidate Conservation Agreements with Assurances (CCAAs) to promote conservation efforts on state and private lands.....	68
Pathway 4: Work towards reestablishing LPCs in southeast New Mexico.....	70
Pathway overview: Opportunities and challenges	70
Conservation Strategy 4.1: Identify, manage and restore potential habitat areas	71
Conservation strategy 4.2: Establish a captive propagation and LPC reintroduction program in southeast New Mexico	74
Pathway 5: Reduce other causes of disturbance and mortality.....	76
Pathway overview: Opportunities and challenges	76
Conservation Strategy 5.1: Seek to reduce mortality by predation	77
Conservation Strategy 5.2: Reduce vehicular mortality and disturbance through road closures and ORV management	79
Conservation Strategy 5.3: Reduce mortality from unlawful hunting and shooting	81
Conservation Strategy 5.4: Reduce winter mortality by planting grain crops	82
Pathway 6: Research, monitoring, and evaluation	83
Biological surveys and habitat monitoring	83
Research needs.....	84
Evaluation of conservation efforts	84
Pathway 7: Education and outreach	85
Public education and outreach	85
Education and outreach to stakeholder groups, agencies and local governments	86
Pathway 8: Coordinating and facilitating participation in conservation efforts	87
The Eastern Plains Conservation Coordinator and the New Mexico Prairie Conservation Initiative	87

Pathway 9: Funding.....	88
Existing governmental funding or incentive programs.....	89
Existing non-governmental programs.....	89
Project contributions by affected parties.....	90
Chapter Five: Recommendations for Sand Dune Lizard Conservation.....	96
5.1 Strategy orientation.....	96
5.2 Landscape analysis and ongoing research	96
5.3 SDL management recommendations <i>in order of priority</i>	97
5.4 Recommendations for further research.....	102
Chapter Six: Moving toward implementation	105
6.1 Completion of Phase I: The LPC/SDL Conservation Strategy document.....	105
6.2 Conclusion of the Working Group process and the role of the Implementation Team	106
6.3 Phase II: Responsibilities of the Implementation Team	106
6.4 Phase II: Responsibilities of the Working Group	108
6.5 Implementation progress to date.....	108
Literature Cited	109
Appendix A: Actions completed or underway	117
Progress report on LPC conservation activities, 2003 - 2005.....	117
Progress report on SDL conservation activities, 2003 - 2005	123
Appendix B: Description of suitable habitat for the sand dune lizard	127
Appendix C: Working Group members and committees	128
Working Group Representatives and Participants	128
Proposed Implementation Team Membership as of May 2005	130
Appendix D: List of maps (fold-outs attached).....	131
Map 1. Planning Area for the Lesser Prairie-Chicken – Sand Dune Lizard Conservation Strategy	
Map 2. Lesser Prairie-Chicken and Sand Dune Lizard Distribution	
Map 3. Lesser Prairie-Chicken Management Regions	
Map 4. Habitat Categories within the Primary Population Area	

(This page intentionally left blank)

Chapter One: The Species and the Working Group

1.1 Introduction

This document presents the findings and recommendations of the New Mexico Lesser Prairie-Chicken/Sand Dune Lizard Working Group, a multi-party group of stakeholders with interests in conservation management and land use decisions in southeast New Mexico, regarding two candidate species for federal listing: the Lesser Prairie-Chicken (LPC) and Sand Dune Lizard (SDL). Both species share a strong association with shinnery-oak dominated habitat that marks the southern and western extension of Great Plains grasslands into New Mexico (see Map 1).

The LPC (*Tympanuchus pallidicinctus*) is a North American grouse species once common in native prairie grassland and shrub communities of the southern Great Plains. Throughout the late 19th and 20th centuries, a large percentage of the species' native prairie habitat was converted to agriculture or other uses, resulting in significant declines in LPC numbers and size of occupied range. These historical circumstances laid the foundation from which additional, ongoing reductions in habitat and population size have become matters of species conservation concern. LPC numbers in New Mexico appear to have fluctuated since the 1950s. A population spike occurred in the relatively wet years of the 1980s, followed by a precipitous decline beginning in 1989 and extending through late-1990s, from which the state population has not yet recovered. Parallel declines, over the same time period, have occurred in other states. In 1995, conservation interests petitioned the U.S. Fish and Wildlife Service (FWS) to list the LPC as a threatened species under the Endangered Species Act. In 1998, the FWS ruled that such listing was warranted, but was precluded by the need to devote limited agency resources to other higher priority species (FWS 1998). At that time the LPC joined the list of “candidate” species for federal listing, where it remains today.

The SDL (*Sceloporus arenicolus*) is a lizard species native to a small area of southeast New Mexico and west Texas. A habitat specialist, the SDL only occurs in sandy-soil dune areas dominated by shinnery oak. Such areas are often separated by large stretches of unsuitable and unoccupied habitat. A history of shinnery oak removal and resource development in southeast New Mexico has increased the fragmentation of habitat available to the SDL. This fragmentation, within a small and possibly shrinking geographic range, has led to conservation and management concern over the future of the species. Most knowledge of the SDL has been obtained by research conducted over the past decade, and species status assessment is ongoing. Conservation interests petitioned the FWS to list the SDL as a threatened species under the Endangered Species Act. In 2001, the FWS ruled that such listing was warranted, but was precluded by the need to devote limited agency resources to other higher priority species (FWS 2001). At that time the SDL joined the list of “candidate” species for federal listing, where it remains today.

In addition to prompting actions by conservation groups and the FWS under the Endangered Species Act, LPC and SDL declines have stimulated new research and a search for solutions on the part of state and federal land management agencies, conservationists, and concerned citizens. The New Mexico Department of Game and Fish (NMDGF) completed management plans for the SDL in 1999 and the LPC in New Mexico in 2001. A multi-agency LPC Interstate Working Group was established in 1997, to prepare a range-wide conservation strategy and coordinate efforts among the five states where LPCs are found today. However, because most conservation decisions regarding the LPC are ultimately local land use decisions, a need exists for collaborative planning and negotiation among stakeholders on a scale smaller than that of the entire species range. This is particularly true in sand shinnery areas of New Mexico, where the needs of both the LPC and SDL must be balanced with the concerns of property owners and land users.

Such a collaborative planning process has been under way in southeast New Mexico since early 2003. At issue has been the formulation of a strategy, acceptable to all affected parties and economic interests, for the conservation of the LPC and SDL in portions of the state where one or both species occur, including sections of Quay, De Baca, Curry, Chaves, Roosevelt, Eddy, and Lea counties. The current or recently occupied range of the LPC in New Mexico constitutes the planning area for this document, and includes the occupied range of the SDL (see Map 1). Other areas of historical LPC habitat, in the northeast quadrant of the state, are thought to have been less recently occupied by the species and are not here considered.

Working Group efforts have focused on both the LPC and the SDL simultaneously. In some respects, issues pertaining to the SDL have proven to be less complex, within the negotiating context of the Working Group, than those pertaining to the LPC. This is due in part to the SDL's much more restricted distribution within the planning area, and to its less extensive area and habitat requirements. As a result, material concerning the SDL comprises a smaller percentage of this document than material concerning the LPC. It should be emphasized however that the Working Group views both species with equal concern. The goal has been to create an overall strategy for the conservation of both the LPC and SDL, focusing on the sand shinnery ecosystem on which both species depend.

This document represents the culmination of over two years of negotiation and planning by the New Mexico LPC/SDL Working Group. Its publication marks the end of a process of broad-scale, consensus-based strategic planning for candidate species conservation in southeast New Mexico. This work, however, is only the beginning. The strategies described herein, for conserving both imperiled species and the economic interests of regional land owners and land users, have value only to the extent that they are implemented "on the ground". The mere existence of a plan cannot solve a problem, but it can structure, guide, and encourage efforts to achieve real solutions. Some of the strategies presented here will require further operational and management planning by state and federal agencies. Some will require the formation of active and effective local partnerships between agencies, private landowners, conservation organizations, local governments, and others. Many will require coordinated efforts to secure necessary funding. All of this, amounting to a Phase II of the overall conservation process, is work that lies ahead, or is just now getting under way.

The purpose of this document is to present and describe the Phase I work of strategy planning and negotiation, undertaken by the Working Group between January, 2003 and May 2005. Following this introductory section, Chapter One provides a brief account of the Working Group's formation, mission, and process of negotiation. Chapters Two and Three present more detailed information on land uses and economic values in the planning region, and on the biology of the species including habitat requirements, population status, and potential threats. It also provides background information on existing species management, and regulatory considerations under the Endangered Species Act. All of these factors together determine the necessities and constraints of conservation planning in the state.

The Working Group's conservation strategy for the LPC is presented in Chapter Four. Introductory sections to that chapter describe goals and priorities for the conservation strategy, and the structure by which it is organized. The strategy consists of many different elements, which collectively address all of the biological needs and threats described in Chapter Three. Some of these elements apply to both the LPC and the SDL. Specific conservation recommendations for the SDL are presented in Chapter Five. Chapter Six summarizes what is already being done to carry out different elements of the conservation strategy, and points the way to the Phase II process of operational planning and project action.

It may be noted that in some respects this document structure differs from that of most other conservation plans or strategies, as often developed within an agency context. This difference is a reflection of the document's origins in a multi-party stakeholder group, working under tight time constraints as described below, and of its broadly strategic intent.

1.2 Formation and membership of the Working Group

In December, 2002, representatives of NMDGF, FWS, the Federal Bureau of Land Management (BLM), the New Mexico State Land Office (NMSLO), and the Wildlife Management Institute proposed that a "Working Group" of appropriate public and private stakeholders begin meeting to devise a conservation strategy for the LPC and SDL. The organizers hoped the various constituencies would be able to negotiate a collaborative plan that would, when implemented, improve the status of the species such that federal listing would no longer be warranted, while protecting the interests of the participating parties. In January, 2003, organizers hired a professional facilitator to begin guiding the process of Working Group formation. The first task was to identify potential stakeholders with an interest in the conservation of the two species, or in any recommendations or policy decisions regarding land use within the planning area of southeast and east-central New Mexico. To accomplish this, the organizing committee proposed carrying out a "situation assessment," followed by an initial meeting at which a collaborative planning process would be established and individual representatives to the Working Group would be identified.

The situation assessment, conducted in January, 2003, consisted of facilitator interviews with 20-25 key individuals from potential stakeholder groups, along with analysis of the interview findings and preparation of a tentative set of ground rules and an agenda for the initial Working Group meeting. These interviews helped the facilitation team understand the central issues and concerns of different stakeholder groups, and also helped the organizers identify additional

individuals who might be important to the process. The interviews revealed a strong interest in a Working Group process that could be completed quickly, in nine months or less. Accordingly, a framework for a six to nine-month planning process was drawn up, for review and ratification at the initial stakeholder meeting.

Individuals from all stakeholder groups and concerned citizens were invited to the first meeting of the “Southeast New Mexico LPC/SDL Working Group”, held in Roswell, NM in February, 2003. About 80 people attended. Participants agreed that criteria for participation in the Working Group should include the ability to communicate clearly, a willingness to negotiate, the capacity to participate in regular monthly meetings until completion of the process, and a willingness to represent and communicate with others in their respective constituency group. It was also agreed that there should be adequate representation of all principal administrative, economic, and conservation constituencies, with participants who could bring technical expertise and local knowledge from different geographic areas within the planning region. Through a process of self-selection and recruitment, the Working Group was officially established with representatives from the following six constituencies:

State and Federal Agencies

- Bureau of Land Management (BLM)
- U.S. Fish and Wildlife Service (FWS)
- Natural Resource Conservation Service (NRCS)
- U.S. Department of Energy (DOE)
- New Mexico Department of Game and Fish (NMDGF)
- New Mexico State Land Office (NMSLO)
- New Mexico Department of Agriculture (NMDA)

Oil and Gas Industry

- Independent petroleum producers
- Large corporate producers
- Associations (Independent Petroleum Association of NM; NM Oil and Gas Association)

Ranching Industry

- Private land operators
- Federal and state permittees

Conservation Interests

- Audubon Society
- The Nature Conservancy (TNC)
- Quivira Coalition
- Wildlife Management Institute (WMI)
- Theodore Roosevelt Conservation Partnership (TRCP)
- Individual conservation biologists

Sportsmen and recreational interests

County and municipal governments

Participants also designated three committees to assist in the planning process. A Coordinating Committee was established to work with facilitators in scheduling meetings, setting agendas, and

distributing materials to the group. This was composed of the original agency organizers plus representatives from the ranching and oil and gas industries. A Technical Committee was established to gather relevant data, consult with outside experts as needed, provide scientific review of the biological status and threats to the species, and comment on potential conservation strategies. This committee included biologists associated with the FWS, BLM, and the University of New Mexico, and independent contract scientists. Finally, a Document Committee was set up to guide the drafting of a broad strategy document based on information and decisions from the Working Group meetings. (Subsequently, at the request of the Document Committee, a professional writer was hired to participate in meetings and draft document text.) Membership of the Working Group and the various committees is presented in Appendix B.

1.3 Goal statement of the Working Group

The initial stakeholder meeting led to the adoption of a mission statement for the Working Group. In its original form this addressed only management strategies for the shinnery oak vegetative community inhabited by the LPC and, across a much narrower range, the SDL. The statement was later modified slightly to encompass the full range of LPC habitats in New Mexico.

The goal statement of the Working Group is:

To create a conservation strategy for the management of shinnery oak and sand sage – grassland communities in southeastern and east-central New Mexico, recommending a range of specific actions to enhance and secure populations of Lesser Prairie-Chickens and Sand Dune Lizards, so that federal or state listing of these species is not needed, while protecting other uses of the land.

1.4 Working Group principles and philosophy

The stakeholder process is based on the idea that the most enduring decisions are made at the local level, through negotiated agreement among all affected parties. Collaborative problem-solving of this kind is often most effective when participants are encouraged to think beyond existing or perceived regulatory, technical, or political constraints. At the same time, however, innovation must be balanced by realistic assessment of what is or is not possible. The Working Group's approach has been to seek consensus around a set of broad-based but practical strategies, with an understanding that further work in developing operational mechanisms and processes must be carried out within the context of specific agency plans and local conservation partnership efforts.

At the outset, participants agreed to the following basic set of operating principles and ground rules for the process:

- No agency, group or individual would give up legal rights, or the option of seeking future legal remedies, by virtue of participation in the Working Group; however, participants agreed that litigation or other regulatory intervention could jeopardize the process.
- The Working Group as a whole would be responsible for the overall conduct and outcome of the negotiation and planning effort.

- Participants would respect one another's personal integrity and values.
- Members would honor all commitments made during negotiation, with the exception of previous commitments rendered unnecessary or invalid by subsequent strategy revisions or modifications agreed to by the group.
- Members would participate in good faith throughout the process, and keep their respective constituencies informed about current and upcoming issues, discussions and decisions.
- Decisions and recommendations would be based on consensus of all Working Group members. Given a failure to reach consensus on a particular issue, dissenting views would be clearly noted in the strategy document.
- Meetings would be open to the public and time would be set aside as necessary for public comment.
- Audio and/or visual recording of meetings would not take place without prior permission.

1.5 History and process of negotiation

Following the initial February 2003 meeting, the group met monthly through October, 2003. At that time—roughly the end of the originally envisioned six to nine months—substantial work remained in reaching consensus around a number of issues. The group agreed to break for the winter, and resumed meeting in March 2004. Work continued throughout 2004, much of it in the context of smaller sub-committees and constituency groups tasked with resolving specific issues. Early in 2005 this work was presented to and further refined by the larger Working Group.

At the outset the facilitation team proposed—and the group adopted—a five-stage planning process designed to move the group expeditiously from developing a common understanding of the issues to adopting an overall conservation strategy. During the first stage, following the adoption of ground rules and a mission statement, participants exchanged written materials and heard presentations by other group members and outside experts, in order to develop a shared understanding of biological, regulatory, and economic issues and constraints. In the second stage, the group worked to condense this background information into a tabular listing of all potential threats to the species, and potential conservation solutions in the form of general or specific management practices that could be undertaken by agencies and/or land users. During this period the relative importance of various possible solutions, as part of an overall conservation strategy, began to be debated.

In stage three, recognizing that threats and solutions varied in conservation importance from region to region, participants worked for two months in geographic sub-groups, to focus on specific projects and management approaches that would be most suitable for different areas. In the fourth stage, the group returned to consideration of broad management standards and practices, with input and recommendations from the Technical Committee. During stages three and four the Document Committee began to consider how the various recognized threats, specific place-based or project-based solutions, and general management guidelines might best be addressed and organized in a strategy document. A document outline and substantial sections of draft text for the “Conservation Strategy” chapters were produced.

The fifth and longest part of the process—extending from October, 2003 to May, 2005—consisted of reviewing and refining strategy proposals around which the group was able to reach general agreement, and seeking to reach compromise solutions in areas that have been more controversial. Progress in formulating and building consensus around more controversial issues continued in a series of stakeholder constituency group meetings in the fall of 2004 and subsequent technical work by subcommittees. A complete initial draft of this document was completed in January 2005 and submitted for Working Group review and approval. Final approval of the LPC and SDL strategy chapters was obtained in February, 2005, and approval of the complete document was given in a concluding Working Group meeting in May 2005.

Chapter Two: The Planning Area

2.1 The ecological context: shinnery oak and sand sage grasslands of southeastern New Mexico

Sand shinnery communities extend across the southern Great Plains, occupying sandy soils in portions of north and west Texas, west Oklahoma, and southeast New Mexico. Estimates of acreage in New Mexico vary, from 1.5 million acres (Peterson and Boyd 1998) to 2.6 million acres (Garrison and McDaniel 1982). The Bureau of Land Management (BLM) estimates that between 400,000 and one million acres of sand shinnery occur on public lands in the state. Some historical areas of sand shinnery have been converted to other cover types, and over 100,000 acres have been treated with herbicide in order to encourage forage production for livestock (Peterson and Boyd 1998). Portions of the LPC range, particularly in Chaves, Roosevelt, Eddy and Lea counties, consist largely or entirely of sand shinnery habitat (see Maps 1 and 2).

The characteristic feature of these communities is co-dominance by shinnery oak (*Quercus havardii*) and various species of grasses. Shinnery oak “forests” consist of massive underground stem systems, with visible shrubs of only one to four feet in height. Under favorable conditions, native tallgrass species may grow higher than the oak shrub layer. In New Mexico shinnery occurs in sandy soil areas, often including dunes. Two midgrass species, little bluestem and sand dropseed, are common throughout. Tallgrass species, particularly in sand dune areas, include sand bluestem, big bluestem, switchgrass and giant dropseed. Various other midgrass and shortgrass species may be present in different sand shinnery associations. In regularly grazed systems there is often a shift away from perennial grass species (bluestems, switchgrass, side-oats gramma, giant dropseed) towards a greater abundance of annual forbs and grasses (sandbur, purple sandgrass, fringed signalgrass, false buffalograss) and a different mix of perennial grasses. Additional shrub species that may be present in the sand shinnery include sand sagebrush, broom snakeweed, four-wing saltbush, and mesquite (Peterson and Boyd 1998, Dick-Peddie 1993).

In south Roosevelt and north Lea counties, an important habitat area for LPCs, Ahlborn (1980) described three distinct community types within the sand shinnery: 1) shinnery oak / sand bluestem or little bluestem associations, indicative of high quality range condition; 2) shinnery oak / midgrass associations, including various grama, dropseed, and three-awn species, indicative of poor to fair range condition; and 3) sandhill areas dominated by shinnery oak with few grasses. Martin (1990) recognized 8 distinct sand shinnery communities in southeast New Mexico, distinguished primarily by different combinations of bluestem, purple three-awn, sand dropseed, hairy gramma, witchgrass, and yucca species.

Shinnery oak is adapted to life in a generally arid climate, with considerable variation in precipitation. It may absorb and store water when available, and may shed its leaves or not leaf out in the spring during times of drought. Thus periods of water shortage are generally more severe on grasses in the sand shinnery than on the oak. Although in most years shinnery oak produces acorns (at times an important food source for LPCs) most reproduction occurs by vegetative cloning. Individual shinnery oak plants grow slowly and live for hundreds of years, and pollen analysis shows that the species have been dominant in its community over the last

3,000 years. Unlike other shrubs, shinnery oak does not spread rapidly into grassland areas when grass cover declines. However, high stocking densities of cattle may effectively transform some areas from grass-shrub co-dominance to systems dominated by shinnery oak. The extent to which shinnery oak cover may impede grass growth has received considerable debate. In southeast New Mexico Davis et al. (1979) found that oak and grass densities were positively correlated with one another: the more oak, the more grass. Other studies have found that grass growth may be impeded in dense shinnery oak stands, and this has led to the controversial practice of applying herbicides to the oak in order to increase forage production (Peterson and Boyd 1998). This issue is further addressed in Chapter Three.

Various bird, mammal, reptile and invertebrate species inhabit the sand shinnery ecosystem in New Mexico. Herbivorous mammals include mule deer, white-tailed deer, pronghorn, and up to 16 rodent species. Carnivores include coyote, bobcat, badger, striped skunk, and swift fox. In addition to the LPC, two upland game bird species, scaled quail and mourning dove, are present throughout the sand shinnery in New Mexico. About 20 species of songbirds nest commonly, with a much larger number that use the habitat during migration or for non-nesting activities. Common avian predators include northern harrier, Swainson's hawk, red-tailed hawk, kestrel, burrowing owl, and Chihuahuan raven. About 25 snake and 10 lizard species have been recorded, including the SDL, the only vertebrate species restricted entirely to sand shinnery habitat.

North and east of the sand shinnery, in parts of Quay, De Baca, Curry and Roosevelt counties, LPCs occur in a second major habitat type, characterized as sand sage - grassland. Sand sagebrush (*Artemisia filifolia*) is present to a moderate degree within the sand shinnery itself, but replaces shinnery oak as the dominant shrub species in sand scrub habitats of east-central and northeast New Mexico (Dick-Peddie 1993). Sand sagebrush is the dominant shrub species in other portions of the LPC's range outside of New Mexico. Additional information on LPC and SDL habitat requirements is provided in Chapter 3.

2.2 The economic context: ranching interests

Ranching is the predominant land use in sand shinnery habitat in New Mexico. Ranchers throughout the planning area have longstanding ties to the land, and many occupy properties passed down from generation to generation. Livestock grazing contributes significantly to the economies of the mostly rural counties in the planning area. Beyond this, ranching is valued as a tradition and a way of life.

Although ranching is considered an economic and cultural mainstay across the region, a variety of pressures—including drought, changing land uses, and the fluctuating price of beef—make the economics of individual ranching operations precarious at times. Area ranchers tend to be wary of new restrictions or regulations that may affect how they do business, and for this reason have expressed a strong interest in avoiding the need for federal listing of any species in their region. As discussed in later sections, ranching can work in the interests of species conservation, and successful ranching operations help protect rangeland habitat from being converted to other land uses. The Working Group has tried to find strategies and solutions that can be supported by the ranching community, and that would not result in unfair economic impacts.

Special consideration must be given to the checkerboard nature of surface ownership in much of the planning area (see Map 2). While some ranching operations are carried out entirely on private lands, most utilize a mixture of private land and federal and/or state lease allotments. In these cases, the income potential for the entire ranch is dependent upon the permitted level of use—specified in animal units—as set according to the terms of the lease agreement.

Management agencies may sometimes adjust allowable grazing levels in response to changing range conditions, and operators may choose to graze their lease allotments below permitted levels to improve grass cover, particularly in times of drought. However, reductions in numbers of cattle grazed cut into earning potential, without a corresponding reduction in costs. The loss or severe restriction of a grazing permit may result in an entire operation becoming no longer viable. In addition, loss or restriction of usage rights on public land will decrease property values. It is important to understand that grazing leases have real economic value—separate from and in addition to the value of the private property with which they are associated—and are subject to inheritance tax. Thus the loss of a lease will negatively affect both the earning potential and the overall value of a ranching operation.

The Working Group has made strategy recommendations for rangeland management practices that will benefit LPCs, coupled with economic compensation for ranchers whose earnings may be affected by the voluntary implementation of these strategies. The group has also identified a need for protection from future regulatory burdens on private landowners in the event of listing. See Chapter 4, "Pre-requisites for implementation" and Conservation Strategies 1.1 and 3.4.

2.3 The economic context: oil and natural gas interests

The planning area of southeastern and east-central New Mexico is also one of the major petroleum-producing regions of the United States, drawing on the oil and natural gas resources of the Permian Basin, Delaware Basin, and Pecos Slope. Development of oil resources in this area dates back to the 1920s. While the region has been subject to cycles of increased and decreased productivity over the years, as different resource strata have played out and oil markets have fluctuated, the industry has remained vital due to ongoing world energy demand and the development of new technologies and methods of extraction. New Mexico currently ranks in the top five states for on-shore oil and natural gas production.

Oil and natural gas producers, and the companies that service and supply them, have for decades been central drivers of the economies of counties in the planning area, and of the state. In southeast New Mexico, roughly 10,000 people are directly employed in oil and natural gas extraction, and over 23,000 are employed in related occupations. Lea, Eddy, and Chaves counties are the largest producers with the greatest dependence on oil and natural gas for jobs and revenues. Much of the economic well-being of these mostly rural counties is tied to royalties generated by petroleum production and the taxes this production generates. Wages in the industry are relatively high, and exceed the state average wage. Employers include both producers and service companies, and range from large companies headquartered out of state to hundreds of small, independent operators. Extraction employment has declined from previous high levels, and efforts are under way to diversify the economic base in the region. However,

lost jobs in the oil and natural gas industry are not easily replaced by comparably high-wage jobs in other fields.

In addition to their local contributions, petroleum producers in southeast New Mexico make significant contributions to state revenues, through taxes, royalties, rent and lease fees, and mining tax fund interest payments. Oil and gas contributes 20-25% of the state's General Fund revenues annually. Over 90% of state lands revenue is generated by oil and gas activity on state trust lands. The Land Grant Permanent Fund, administered by the State Land Office, generates investment returns on royalties from oil and gas production, which are used to fund public education throughout the state. New Mexico also receives a percentage of mineral leases paid to the federal government for resource extraction on federally-owned public lands. Factors that may restrict or preclude full development of state and federal lands will thus affect the flow of revenues into local and state economies.

To understand how land management decisions made in the interest of conservation may impact the oil and gas industry, it is useful to understand the broad sequence of events by which development typically proceeds. Royalty revenues are generated both at the time of leasing and during active production. From an industry perspective, it is important to note that state and/or federal regulations, and the ensuing need for added economic expenditures by producers, are present at each stage in the process. Abrupt changes in regulations, and delays caused by regulatory compliance, can be highly disruptive to producers in planning for and carrying out the long-term, capital-intensive process of lease acquisition and development. In brief outline, the normal steps in this process include the following.

1. Leasing. A potential producer must acquire the right to develop an oil or natural gas reserve, by contractual agreement with the mineral owner. This is often either the state of New Mexico or the federal government.
2. Exploration. Having acquired a lease, the producer carries out geologic and seismic studies to locate optimal sites. Well location and right-of-way easements must then be negotiated with surface owners.
3. Permitting. Before production can begin, operators must obtain permits for their proposed development. In this process, environmental, archaeological, and other surface issues are addressed. Many state and federal regulations guide the permitting process. The well spacing (number of wells per section) allowed for any mineral formation is determined by the New Mexico Oil Conservation Division (NMOCD).
4. Drilling, casing, and well production. Drilling is usually done by a drilling contractor, working around the clock until the process is completed. The drilled hole is sealed with cement and steel casing to prevent fluids from migrating. Well construction begins after drilling and casing is finished.
5. Active production. When all construction tasks have been completed, the site becomes operational and production begins. A given well may remain active for a period of years to decades.

6. Reclamation. After drilling, any disturbed area not needed for production operations must be reclaimed by returning it to as close to its original condition as possible. Operators must dispose of drilling waste materials, fill pits and holes, and remove compaction from the soil. Restoration and revegetation requirements must also be met, as determined by the lease agreement.

7. Plugging and Abandonment. After all recoverable resources have been drained from a site, the well is plugged and abandoned. Final reclamation includes the removal of all production equipment and wastes, closing of access roads, and revegetation.

2.4 Land ownership and use

Most of land within the planning area falls into one of three categories: privately owned lands, New Mexico state trust lands, and federal public lands managed by the BLM. (There are some exceptions, such as federal lands managed by the DOE in Eddy County, and the state-owned Prairie-Chicken Areas (PCAs) managed by NMDGF.) The overall pattern of land surface ownership in the area of LPC and SDL distribution is shown in Map 2. The entire planning area includes approximately 1,182,930 acres of BLM lands, 1,008,250 acres of state trust lands, 3,787,460 acres of private lands, and 39,330 acres in other ownership categories.

As can be seen in Maps 2 and 3, surface ownership patterns are not evenly distributed across the planning area. Federal holdings are more extensive in the south, while state and private lands dominate in the north. The Working Group's conservation strategy for the LPC recognizes a division of the planning area into three regions, based on differences in LPC population status (see section 3.1), and these vary greatly in surface ownership. A southern "Isolated Population Area" mostly in Lea and Eddy counties includes 884,630 acres of BLM lands, 437,500 acres of state trust lands, 528,830 acres of private lands, and 10,250 acres of other ownership. A central "Primary Population Area" in east Chaves, north Lea, and south Roosevelt counties includes 75,410 acres of BLM lands (including 56,620 acres within the Roswell Core Management Area), 216,220 acres of state trust lands, and 632,610 acres of private lands. Farther north, a "Sparse and Scattered Population Area" includes 222,870 acres of BLM lands (including 66,000 acres of the Roswell Core Management Area), 354,290 acres of state trust lands, 2,625,690 acres of private lands, and 29,080 acres of other ownership.

In many areas, land surface and subsurface mineral rights are owned by two different parties, adding complexity to the overall pattern of land use and management. For example, although Map 3 shows little BLM surface ownership in the eastern half of the LPC Primary Population Area, mineral rights over an extensive portion of this region are federally-owned and leased. Overall the BLM administers approximately 1,989,750 acres of subsurface minerals across the planning region. The NMSLO administers an additional 1,250,150 acres of subsurface minerals.

Chapter Three: Species Biological Background and Conservation Status

3.1 LPC distribution and status

Historical records indicate that the Lesser Prairie-Chicken (LPC) was once distributed over large areas of suitable habitat within the five states where remnant populations survive today: Colorado, Kansas, New Mexico, Oklahoma, and Texas. Total LPC population size and distribution have declined substantially since the early 1800s, including a 78 percent reduction in size of occupied range since 1963 (Crawford 1980, Taylor and Guthery 1980). Thus today's relatively small and isolated populations represent an enormous change from historical conditions. Outside of New Mexico, LPC populations exist today in southeastern Colorado and southwestern Kansas, western Oklahoma and the Texas panhandle.

In New Mexico, the LPC historically occupied sandhill country of the eastern plains, including sand sage - bluestem communities in the northeast and east-central parts of the state, and shinnery oak - bluestem communities in the southeast (Ligon 1961). Ligon (1927) produced a map of the historical range of the species, which included parts of 12 counties in eastern New Mexico from the Colorado border in the north to the Texas border in the south. Currently the LPC is absent or near extirpation from 56 percent of its historical range in the state (Bailey and Williams 2000). It has not been observed in the northeastern portion of the state (north of Interstate 40) since 1993 (Smith et al. 1998).

Bailey and Williams (2000) divided the LPC range in New Mexico into three categories, based on population status, and an updated version of that scheme has been adopted for this plan (see Maps 2 and 3). Within the planning unit of east-central and southeast New Mexico, *isolated* population areas occur in east Eddy and south Lea counties, north from the Texas border to 33 degrees latitude. These are described as areas where LPC populations are extirpated, or nearly so. At present a single known lek exists in south Lea County, though LPCs have been sighted in other areas and the existence of additional leks is suspected. *Scattered* populations occur in two areas: southeast Chaves county south of Highway 380, and areas north of 34 degrees latitude, primarily in north Roosevelt and Curry counties but also including small portions of east De Baca and south Quay counties. *Well-distributed* or core populations exist in roughly 16 percent of the historical range, north of Highway 380 and south of 34 degrees latitude in north Lea, south Roosevelt and northeast Chaves counties.

It is likely that LPC populations in New Mexico have experienced significant fluctuations over much of the 20th century. While formal survey data are lacking, anecdotal accounts from biologists, game managers and land users indicate that restriction of at least the majority of the New Mexico LPC population to the central portion of the range may have occurred during drought periods of the early 1930s and early 1950s (Ligon 1953, Massey 2001). Greater abundance and more widespread distributions were reported in the late 1950s and early 1960s, and again in the 1980s (Snyder 1967, Massey 2001). The current status of the LPC in New Mexico is the result of a significant decline beginning after the population increases of the 1980s.

Similar declines in other states—particularly Oklahoma and Texas—resulted in a finding by U.S. Fish and Wildlife Service (FWS) in 1998 that the LPC was warranted for listing under the Endangered Species Act. This listing was precluded by other higher priority actions and the chicken was placed on the FWS candidate species list.

While it is impossible to conduct a complete and accurate census of LPC numbers, biologists can monitor population trends by several methods, including roadside surveys, counts of males seen per lek, and surveys of lek density in a given area. Bureau of Land Management (BLM) survey data for the Caprock Wildlife Area in Chaves and Roosevelt counties showed increases through the mid to late 1980s, followed by an abrupt decline in 1989 (Johnson and Smith 1999). Increased survey effort through the 1990s continued to record an average of 110 LPCs per year, far below the peak of 1400 birds in 1986. Similar declines were documented by surveys in west-central Lea County, where LPCs went from a peak of 160 birds at 20 lek sites in 1987 to only two birds at one lek site in 2000 (Bailey and Williams 2000; see Map 2). In 1998 only 1 of 29 historic leks in Eddy and southern Lea counties was found to be active, and no new leks were detected on 244 miles of roadside surveys (Massey 2001). Since that time surveys and casual sightings in this region have documented a few individual birds but no new active leks.

For the past eight years the New Mexico Department of Game and Fish (NMDGF) has conducted roadside surveys to identify active leks on public and private lands in "core" and "sparse and scattered" portions of the occupied range. The total number of leks detected has remained generally stable since 1999. NMDGF also conducts surveys on 29 designated Prairie-Chicken management areas (PCAs) and some adjacent private lands in northern Lea and southern Roosevelt counties. These surveys have documented an increase in LPC leks, and in numbers of birds observed since 1996, possibly indicating a reversal of the downward trends of the early 1990s in areas where the species receives management protection (Davis 2003).

3.2 LPC species ecology, life history and population dynamics

Understanding and responding to the causes of LPC declines requires consideration of both the biological needs of the species and changes to its habitat. Important characteristics of the LPC, from a conservation perspective, stem from the bird's unique physical and behavioral adaptations to southern Great Plains shrublands, and from the biological legacy it shares with other prairie grouse species of North America. Like other grouse, the LPC is a relatively short-lived bird whose life history is characterized by high reproductive potential (10-14 eggs per clutch) counterbalanced by high rates of mortality, most commonly by predation on eggs, chicks, or adults (Giesen 1998, Bidwell et al. 2001).

Results from a number of studies indicate that most LPC nests fail due to egg predation or abandonment, before chicks are hatched (Giessen 1998). Additional mortality of chicks prior to fledging, and of broods after leaving the nest, further limits recruitment into the adult population. Total first-year mortality (prior to reproductive age) of LPCs may exceed 65%, and annual adult mortality is over 50% (Campbell 1972, Giessen 1998). As a result, while only a small fraction of LPCs survive from egg to adulthood, complete turnover of individuals in a population may occur in less than five years. Adult mortality is greatest during the spring months when LPCs are

engaged in display, dispersal and nesting activities (Wolfe et. al 2003, Wolfe and Patten 2003; see Threats to the LPC in New Mexico, below).

LPC populations are sustained by each year's small percentage of successful nests, and smaller percentage of surviving chicks. Environmental factors that affect rates of nest success and chick survival in a given year, or over a series of years, thus exert a strong influence on populations and may bring about fairly rapid swings in numbers. In the closely related Greater Prairie-Chicken, nest success and brood survival have been determined to be the primary factors driving population trends (Wisdom and Mills 1997). The same is likely true for the LPC and other prairie grouse species (Bergerud 1988, Giesen 1998, Applegate and Riley 1998, Bidwell et al. 2001). The potential of local LPC populations to respond to changes that may increase or decrease nest success and recruitment is a key consideration for the conservation of the species.

As is the case for other prairie grouse, LPC life revolves around the mating display areas known as gobbling grounds or lek sites. These are typically situated in open, slightly elevated areas with minimal vegetation. Males gather at lek sites, in groups of 10-20 or more, for several months during the spring breeding season, and often again in the fall. Females attend the leks for shorter periods, typically from late March to May, and it is at these times that display activity is greatest. At each lek site males defend small territories and try to attract females through gobbling competitions and ritualized displays. After mating occurs, hens select nest sites in appropriate habitat away from the lek site (see Habitat Requirements below). Laying the complete clutch of eggs takes up to two weeks, and is followed by 24-26 days of incubation. Eggs and incubating hens are highly vulnerable for this 40-day period, which typically extends through May and early June. Chicks leave the nest within a day of hatching, but remain in the care of their mothers for up to 12 weeks before dispersing into the general population. Juvenile males attend established leks in the fall, and young females breed for the first time the following spring (Giessen 1998, Bidwell et al. 2001).

Leks can only exist where the various habitat elements required for displaying, nesting, brood-rearing, and winter feeding can all be found in fairly close proximity (see Habitat Requirements below). Leks usually occur in clusters, in areas of suitable habitat, and multiple leks are required to maintain a viable population (Bidwell et al. 2001). The size (number of males) of a given lek typically varies over time with habitat quality and population density. New leks are most likely to become established during periods of population expansion. Established leks may be abandoned due to disturbance, reduction in habitat quality or local population decline. Male fidelity to existing lek sites, and the social nature of the species, make the establishment of new leks a relatively infrequent occurrence, and this may constrain the rate at which LPC populations may occupy or reoccupy areas of suitable habitat.

The diet of LPCs in New Mexico's shinnery oak - grassland community has been studied in detail, and shows considerable variation throughout the year. In the spring, LPCs feed primarily on green vegetation (leaves and flowers) and, to a lesser extent, on seeds. The summer diet of adult birds consists of about one half insects (mainly grasshoppers and treehoppers), one quarter vegetative material, and one quarter seeds; juveniles feed almost entirely on insects (Davis et al. 1980). In the fall and winter, LPCs may rely heavily on shinnery oak acorns for the majority of their food supply. Seeds and leafy vegetation remain a part of the diet and may be relied upon in

years when no acorns are produced (Riley et al. 1993), and are important in sand sage - grassland habitats.

Grain fields are also used for winter foraging in areas where cultivated lands occur in the vicinity of rangelands. The importance of grain crops in helping maintain LPC populations through times of food scarcity is not known. Bidwell et al. (2001) note that food is generally not a limiting factor for upland game birds such as the LPC. They go on to say however that food plots may sometimes benefit small populations in fragmented habitats.

LPCs occasionally use surface water where it is available, typically from stock ponds. However the species evolved in an environment frequently devoid of standing water, and has the ability to meet its water requirements solely through the consumption of vegetation and insects (Giessen 1998). It is not known if the availability of surface water increases survival during drought periods, when food availability and water content may be low.

3.3 LPC habitat requirements

A combination of local habitat and landscape features is required to meet the needs of the LPC throughout its annual cycle, and to sustain populations over longer intervals. Areas of potential habitat may fail to meet species needs if one critical element is missing; conversely, superior habitat in which all elements are present may fail to conserve the species if it exists only as a series of "islands" too small to host viable breeding populations, and too isolated for dispersal to occur. In broad terms, LPC habitat consists of native grassland and shrubland adapted to a disturbance regime that includes grazing by large herbivores (Bidwell et al. 2001). Suitable habitat contains both early and late stages of plant succession, including open areas with sparse vegetation, native annual forbs, perennial native tallgrasses and forbs, and native shrubs (Bidwell et al. 2001). Different land uses, and the presence of non-native plant species, may greatly affect the frequency and magnitude of disturbance and the patterns of succession that occur. In southeastern New Mexico, LPC habitat occurs in sand shinnery communities dominated by shinnery oak and several species of bluestem, grama, and dropseed grasses. In ungrazed or lightly grazed areas, native tallgrass species such as sand bluestem may grow higher than the relatively low (1-3 ft.) shinnery oak canopy. In east-central New Mexico, where shinnery oak does not occur, the shrub component of LPC habitat consists largely of sand sagebrush.

3.31 Lek sites

Open "gobbling grounds" for display and mating are an important part of LPC habitat. LPC lek sites are typically established on small, elevated areas with bare soils or very sparse vegetation. Suitable conditions for lek sites exist where there is a high degree of surface disturbance, including heavily grazed areas, prairie dog towns, old roads, abandoned oil and gas well pads, and herbicide treatments. In New Mexico there is no shortage of potential lek areas; however, certain types of human-caused disturbance may interfere with courtship and mating activities, and cause the abandonment of lek sites. (See discussion under Threats below).

3.32 Nesting Habitat

The supply of safe nest sites is thought to be a primary factor limiting populations of prairie grouse, including the LPC. A common finding of studies in New Mexico and elsewhere is the importance of tallgrass cover for nest success. In shinnery oak and sand sage - grassland communities, such cover is provided by perennial bunch grasses. Nesting habitat for LPCs is subject to an important ecological constraint that arises due to the timing of the annual breeding period. Because LPCs nest early in the growing season, residual tallgrass vegetation from the previous year is needed to provide nesting cover (Davis et. al 1979, Riley et. al 1992).

Nests are most often located in sandhill areas, on north-facing slopes for protection from direct sun and prevailing winds. Studies in Chaves County have shown that over large areas containing multiple types of vegetation, LPCs exhibit strong preferences for nesting in shinnery oak - tallgrass habitat in general, for patches containing the most sand bluestem in the 10-foot diameter area around the nest, and for sand bluestem clumps as nesting cover. LPCs avoid nesting in mesquite and shortgrass-dominated areas where sand bluestem is absent (Davis et. al 1979). Bluestem grasses grow in clumps that are taller and denser than surrounding vegetation, providing greater concealment both from the air and at ground level. In Oklahoma, vegetation at nests was about five times higher and three to five times denser than at random points (Wolfe et. al 2003).

LPC preference for tall grassy vegetation is almost certainly due to the greater protection it provides. In Chaves County, nests placed in habitat areas in which sand bluestem was the dominant grass species were three times more likely to succeed than those placed in other habitat types. Within bluestem-dominated habitat, nests placed directly in sand bluestem clumps were significantly more successful than those placed in other types of vegetation. Average bluestem height was 26 inches at successful nests versus 14 inches for unsuccessful nests (Davis et al. 1979). Several reports have recommended a grass height standard of roughly 18-20 inches for nesting habitat (Wildlife Habitat Management Institute 1999, Bidwell et al. 2001, Jamison et al. 2002). Density of vegetation at the nest site and width of bluestem clumps also play a role in determining nest success (Riley et al. 1992, Giesen 1998). Tallgrass growing in dense clumps 3-10 feet in diameter may be optimal (Wildlife Habitat Management Institute 1999).

While tallgrasses are crucial for nesting cover, shrub cover is also a necessary component of good nesting habitat in New Mexico. Where present, shinnery oak may provide a vital part of the LPC's annual food supply, and is important for shade and escape cover. Successful nests in Chaves County were located in patches in which the vegetation was roughly 65% grasses and 30% shinnery oak. More generally, Bidwell et al. (2001) recommend the maintenance of at least 20% low shrub cover. Vegetation of the appropriate size and composition for successful LPC nesting develops at an advanced stage of plant succession. It occurs in areas with a relatively light or patchy disturbance regime. Heavy disturbance that prevents the establishment of perennial tallgrass cover over large areas tends to result in habitat that is unsuitable for LPC nesting.

3.33 Brood-rearing habitat

Habitat for chick foraging and brood rearing occurs within the same shinnery oak - grassland and sand sage - grassland vegetation types as nesting habitat, but may differ somewhat

in composition and structure. Young LPCs leave the nest soon after hatching, and hens may lead their broods far from the nest site in search of food. Brood rearing habitat typically contains more bare ground (roughly 60%) than nest areas, with more forbs, less grass cover, and lower grass height. (Applegate and Riley 1998). Thus, brood-rearing habitat represents an earlier stage of plant succession than that used for nesting, and may be present in more frequently disturbed areas.

Forbs and shrubs are important for brood-rearing because they support the insects that constitute the primary diet of LPC chicks. Forb cover in particular has been associated with higher levels of insect abundance (Jamison et al. 2002). Leafhoppers, an important food of LPC chicks, are associated with shinnery oak. Bare ground areas are used for locating seeds and capturing insects. A shrub component is important for shade and cover. Surface disturbances such as fire can increase the amount of weedy and open areas associated with quality brood-rearing habitat (Boyd and Bidwell 2001). Optimal vegetative cover for brood-rearing has been characterized as 20% forbs, 40% grasses and 40% shrubs (Davis et al. 1980, Applegate and Riley 1998).

3.34 Fall and winter habitat

LPCs typically range across larger areas during the fall and winter months, occupying the same general types of habitat as are used for nesting and brood-rearing. Habitat use depends largely on the availability of food resources, particularly seeds, shinnery oak acorns, and green vegetation. Grain fields may be used for foraging if they are located adjacent to habitat that provides adequate cover for resting and concealment.

3.35 Area requirements for populations

Ultimately the survival of populations depends on the number and size of leks a particular region can support, and on the degree to which the regional landscape allows for the dispersal of birds from one population unit to another. Bidwell et al. (2001) note that the combined home ranges of all birds at a lek may exceed 12,000 acres, or 19 square miles. This includes a central 2-4 square mile core of prime nesting and brood-rearing habitat, and a larger surrounding area for year-round foraging. For a LPC population to remain viable even in the short term, breeding must take place across a series or complex of leks. Bidwell et al. (2001) state that 25,000 acres of "contiguous high-quality native rangeland" may be the minimum land area required to maintain a healthy and sustainable LPC population.

Applegate and Riley (1998) recommend clusters of 6-10 or more leks, each with a minimum of six males, separated from one another by a distance of 1.2 miles or less. A number of studies have reported inter-lek distances of a mile or less (Jamison et al. 2002). At such densities, a complex of 6-10 lek sites could fall within a fairly compact area of roughly four square miles. If each lek in the cluster was surrounded by a one-mile radius area of suitable nesting and brood-rearing habitat, the entire lek and core habitat complex might occupy up to 16 square miles, with a wider perimeter of habitat for autumn and winter foraging and escape cover. This is more or less consistent with the 25,000-acre estimate of Bidwell et al. (2001).

3.36 Landscape composition and connectivity

The ability of a landscape to support LPCs is reduced by the extent of unsuitable or poor quality habitat. Landscape fragmentation is a term that describes the presence of poor quality

habitat, non-use areas, and barriers to dispersal within the range of a species. The loss or fragmentation of broad habitat areas is thought to be the primary factor behind historical LPC population declines. Fragmented or poor-quality habitat may support only declining populations due to high rates of nest failure or other mortality.

Fragmentation affects the broad-scale suitability of a landscape for LPCs in several related ways. When large patches of unsuitable habitat are present, a greater total area may be required to provide sufficient resources to support a viable population. Remaining high-quality habitat occurs in patches that are reduced in size, and distant from one another. Smaller patches can support fewer individuals, are less likely to contain all the different habitat elements that LPCs require throughout their annual cycle, and may become target areas for predators. The effects of patch size reduction are magnified by LPC avoidance of—or increased vulnerability in—"edge" areas close to the source of fragmentation or disturbance. As fragmentation increases, a breeding population may be split into a series of smaller sub-populations, each with a low probability of long-term survival unless significant genetic interchange continues to occur. Dispersal of individuals from one population unit to another tends to be limited by all of the factors mentioned above: the small size and isolation of occupied patches, and the presence of non-habitat areas that may serve as barriers to movement.

Thus from a population perspective, LPC habitat requirements include the presence of large, interconnected areas containing a high percentage of usable habitat. Within such areas, suitable nesting cover must be present in areas within two miles of leks (Wildlife Habitat Management Institute 1999.) Applegate and Riley (1998) state that clumps of nesting habitat should be distributed at a high density—several per acre—to avoid attracting predators. Bidwell et al. (2001) recommend that at least 20 percent of the landscape around leks should support native tall grasses. The distribution of remaining LPC populations suggests that the species cannot survive in landscapes with greater than 37% cultivation, less if other sources of fragmentation are also present (Crawford and Bolen 1976, Bidwell et al. 2001). Recent studies in Oklahoma and New Mexico have noted a correlation between various indices of landscape change or fragmentation and declining LPC populations (Woodward et al. 2001, Fuhlendorf et al. 2002). (Also see discussion under Threats below).

To the extent that a landscape fails to provide large areas of high-quality habitat, it must provide features that prevent the complete isolation of occupied areas from one another. Such features may be corridors or zones of permeability through which successful dispersal can occur. Habitat in these areas may not be of sufficient quality to support year-round occupancy, but must maintain characteristics that allow the passage of individuals. The dynamics and habitat requirements of dispersing LPCs have not been studied in detail, though it may be assumed that, as in all facets of the species' life cycle, escape cover is particularly important.

3.37 Habitat selection and avoidance

Species select habitat, and in this sense the ultimate arbiter of habitat suitability is the species itself. But looking at where a species is distributed at a given moment in time may not produce a full understanding of habitat requirements. In areas with high rates of landscape change, populations may persist for a time even though requirements for long-term survival are no longer met. Species with high site fidelity and slow dispersal rates like the LPC may exhibit a

lag in responding to environmental changes, and thus populations may not efficiently track locations of highest quality habitat (Knick and Rotenberry 2000, Fuhlendorf et al. 2002).

Some features on the landscape may cause behavioral avoidance by LPCs of areas that are suitable in other respects (e.g. appropriate grass and shrub cover). Zones of avoidance may greatly increase the effective fragmentation of a landscape area (Robel et. al 2004). Avoidance may be the result of regular or periodic disturbance—as in areas near a busy road—or perceived threat, as in areas near vertical structures that provide hunting perches for raptors. While LPCs may enter agricultural areas for foraging, they generally avoid farm fields and areas of human activity during periods of nesting and brood-rearing. (See further discussion under Threats below).

3.4 Threats to the LPC in New Mexico

Throughout the range of the LPC, widespread conversion of native prairie to cultivated cropland has been the primary driver of population declines over the past century, and significant threats to the species today continue to be habitat-related. While cropland conversion continues in some areas, populations also contend with reduced habitat quality in remaining prairie rangelands, and with broad-scale fragmentation of historically occupied areas stemming from various forms of development and changing land uses.

LPC population levels naturally fluctuate, declining and rebounding over periods of lesser or greater habitat quality and resource abundance. However, history has shown that such short-term fluctuations may be overlain by long-term trends. A population in which, on average, more breeding-age birds die each year than are added to the population will show a downward trend, and cannot persist if this trend is not reversed. Thus at a very basic level, a threat may be anything that contributes to a negative balance over time between the number of individuals entering and leaving a breeding population.

An important consideration is that, because this balance between mortality and recruitment is the result of many different influences, threats are cumulative. For example, a population decline may be the result of a slight increase in adult mortality coupled with a slight decrease in numbers of nesting attempts, rate of hatching success, and rate of juvenile survival. Each of these effects may be tied to one or more separate or overlapping environmental causes, which may vary in significance from region to region. The multifaceted nature of threats points to the importance of a broad-based conservation strategy, capable of positively influencing species status at a number of critical "leverage points" through which environmental conditions impact population parameters.

All major types of land use within the LPC's range have the potential to affect populations, independently or in conjunction with one another and with natural factors. Principal threats to LPCs in New Mexico may be grouped into three broad categories of impact: degradation of seasonal habitat, habitat loss and fragmentation, and direct disturbance and mortality.

3.41 Degradation of seasonal habitat

Habitat changes occur for a variety of reasons, both natural and human-caused. Climatic variation on seasonal, annual, or longer timescales is perhaps the most important determinant of habitat quality for LPCs in New Mexico. Rainfall patterns strongly influence the availability and quality of nesting and escape cover, and food resources. These factors in turn directly affect the population status of LPCs, as reflected in annual rates of mortality and reproductive success (Merchant 1982). Drought intervals periodically restrict plant growth and reduce habitat quality over large portions of the species' range in the state. Southern portions of the range, which on the average receive less total precipitation (e.g. the Carlsbad region), are impacted more frequently and more severely by drought. Existing data suggest that LPC populations in this region may have always been smaller and more variable than those farther to the north.

LPCs are adapted to a prairie ecosystem with low and variable rainfall, and have persisted through natural extremes of climatic variation in New Mexico including drought periods in the 1930s and 1950s. Populations are thought to have decreased during those periods, and recovered when rainfall returned to average or above-average levels. Impacts of drought may be significantly worsened, however, by other factors which in combination may further reduce habitat quality, or hinder the dispersal of birds to regions where conditions are more favorable (Merchant 1982).

Livestock grazing is the predominant land use across the LPC's range in New Mexico, and thus plays a major role in determining habitat quality. Like rainfall cycles, grazing by large herbivores has always been a significant ecological force throughout the range of the LPC. Grazing is not necessarily detrimental to LPCs, and can be useful in maintaining the varied seasonal habitat required by the species (FWS 1998, Applegate and Riley 1998, Bidwell et al. 2001). In its finding that the LPC is warranted for federal listing, the FWS stated that areas of heavy, moderate, and light grazing are necessary on a landscape scale to provide suitable habitat (FWS 1998). However, grazing that results in insufficient residual grass cover for successful nesting, or otherwise lowers LPC recruitment by reducing the availability of good nesting and brood-rearing habitat, is considered a threat and may cause population declines (Taylor and Guthery 1980, Applegate and Riley 1998, FWS 1998, Leslie et al. 1999, Mote et al. 1999, Bidwell et al. 2001, Jamison et al. 2002).

The impacts of grazing on LPCs can vary widely, depending on climatic conditions, the state or health of range vegetation, and the type of grazing regime employed. Drought tends to magnify grazing impacts, as both processes reduce plant cover. When forage is reduced by drought, what remains tends to be grazed more heavily unless utilization of vegetation is reduced through grazing management practices.. As a result, some grazed areas may supply adequate habitat during periods of normal rainfall, but be unable to support LPCs during droughts (Merchant 1982). Intensive and/or persistent grazing may reduce or eliminate residual tallgrass cover needed for nesting (Davis et al. 1979, Riley et al. 1992, Johnson et al. 1998). Heavy grazing that repeatedly interrupts plant succession over a broad area may result in the conversion of tallgrass prairie to shortgrass or forb-dominated habitat (Litton et al. 1994, Jamison et al. 2001). For these reasons, recent synopses of risk assessment and management guidelines for the LPC have recommended the use of light, deferred, or rotational systems designed to leave interspersed

areas of early and late-stage plant succession (Applegate and Riley 1998, Mote et al. 1999, Wildlife Habitat Management Council 1999, Bidwell et al. 2001, Jamison et al. 2002).

The quality of rangeland habitat for nesting and brood-rearing may also be affected by other processes. In some areas, the spread of mesquite or other drought-tolerant shrubs has altered or reduced the sand sage - grassland or sand shinnery habitats preferred by LPCs. Non-native grasses, as have commonly been planted in Conservation Reserve Program (CRP) fields intended to maintain grassland habitat, may not have the characteristics needed for optimal nest cover. Improper or excessive use of herbicides for shinnery oak control may result in the loss of an important source of food and protective cover, and can make treated areas unsuitable for occupancy by LPCs. Fire, both as a natural ecological process and a management tool, may help provide the necessary range of successional stages LPCs require. On a local scale, however, uncontrolled or poorly managed fire can eliminate residual nesting cover (Peterson and Boyd 1998). Habitat may also be reduced in quality by various forms of landscape fragmentation, which are addressed in the section below.

3.42 Habitat Loss and Fragmentation

Various factors alone or in combination may result in the loss or fragmentation of habitat used by LPCs. Impacts from the pressures discussed above—drought, grazing and shrub incursion—may, if severe and prolonged, make some areas unsuitable for occupancy. Land conversion for irrigated agriculture, or some forms of development, can directly eliminate rangeland habitat. Other forms of infrastructure development, such as construction of roads and power lines, may leave large areas of rangeland relatively intact but create significant zones of avoidance beyond the physical development footprint. In all of these cases habitat is lost and the total area available to support LPCs is reduced.

Across the range of the species, cropland conversion is the primary factor responsible for the large reductions in LPC habitat since the 1800s (Crawford 1980, Taylor and Guthrie 1980). Where cropland conversion is occurring, the area of habitat effectively lost to LPCs may be far greater than the area actually plowed. Landscapes in which more than 37 percent of native rangeland has been lost may be incapable of supporting LPCs, and populations have declined in areas with only 20 percent rangeland conversion (Crawford and Bolen 1976, FWS 1998). In Kansas, LPCs avoided nesting within 300-400 yards of fields with center-pivot irrigation, effectively increasing the impact footprint of agricultural lands (Robel et. al 1994). Irrigation drawing on the Oglalla aquifer has resulted in extensive conversion of LPC rangelands to croplands in Texas and Oklahoma, but this has not been considered a major factor in New Mexico (Leslie et al.1999, Massey 2001). In recent years, however, areas of LPC habitat in Curry and Roosevelt counties have been plowed to grow crops or forage for a rapidly growing dairy industry in eastern New Mexico.

Direct conversion of rangeland to some other land use is only the most extreme of a number of processes that may produce fragmentation of LPC habitat. Other sources of impact on the natural structure and continuity of sand-shinnery and sand sage - grassland habitats include oil field infrastructure and access roads, highways, power lines, fences, buildings, shinnery-oak treatments, and tree plantings or windbreaks. As a group, prairie grouse species may be particularly sensitive to habitat fragmentation due to their short dispersal distances and relatively

broad area and habitat requirements (Braun et al. 1994). Recent LPC declines in the southern portion of its range in New Mexico, although probably at least in part drought-related, have led to concern over the effects of fragmentation caused by oil exploration and drilling (FWS 2002). While it is often difficult to describe cause-and-effect linkages between specific sources of fragmentation and eventual population responses, recent studies have found LPC population declines in Oklahoma and New Mexico to be associated with several measures of overall habitat fragmentation, including patch size, edge density, and total rate of landscape change (Woodward et al. 2001, Fuhlendorf et al. 2002).

Impacts of fragmentation are cumulative, and are often mediated by behavioral responses to whatever change is occurring on the land. A growing body of evidence suggests that LPCs actively avoid areas of human activity, noise, and proximity to vertical elements that may provide hunting perches for raptors, particularly during nesting. Data from several studies indicate that prairie grouse including LPCs may avoid or nest at reduced rates in areas near roads, power lines, compressor stations, and inhabited dwellings (Robel et al. 2004, Braun et al. 2002, Lyon and Anderson 2003). Thus, the presence of these features may result in LPC abandonment of areas that seem to contain a high percentage of otherwise suitable habitat, effectively increasing the impact of these features far beyond their physical footprint. In Wyoming, sage grouse hens from leks located close to roads were less likely to nest (Lyon and Anderson 2003). Recent studies in Kansas showed that LPCs seldom nest within 200 yards of oil or gas wellheads, 400 yards of power lines, 860 yards of improved roads, and 1,370 yards of large structures. The authors calculated that nesting avoidance at these distances would effectively eliminate a large percentage of available habitat to nesting LPCs over a three-county area (Robel et al. 2004).

Studies are currently under way to determine if noise from oil drilling may have played a role in the recent abandonment of a number of historically active lek sites in the Carlsbad area. Preliminary data over two years show that inactive lek sites are exposed to higher ambient sound levels than active sites (Hunt and Best 2002). The same study also reports a significantly higher number of operating wells within one mile of inactive than active lek sites. Whether this pattern of lek abandonment reflects sensitivity to noise or some other form of disturbance associated with drilling activities, or is a response to factors not associated with drilling, remains unknown. However, all of these studies emphasize the importance of taking behavioral avoidance into consideration when assessing development impacts on LPC habitat.

Landscape features that reduce the size of contiguous habitat patches can be barriers to movement and dispersal. Individuals forced to venture into marginal areas in search of resources may be at increased risk of predation or other causes of mortality. This kind of impact may be increased during drought, when LPCs typically expand their home range size to gain access to suitable habitat (Merchant 1982). On a broader scale, barriers to dispersal between lek sites or complexes can isolate breeding populations, and lead to a series of deleterious effects associated with small population size. Small populations are inherently more vulnerable to periodic disturbances that may cause a downward fluctuation in numbers. They may also experience reduced vitality due to losses of genetic diversity. When a large breeding population is divided into a series of isolated units, gene flow is reduced and inbreeding occurs. Over time, this may reduce breeding success. Long-term studies of the closely related Greater Prairie-Chicken

tracked a process in which reduction in population size (from 2000 to 50 over 30 years) was accompanied by reduced fertility and hatching rates, which in turn contributed to declines and offset habitat improvements intended to help the population recover (Westemeier et al. 1998). Although one recent study (Van den Bussche et al. 2003) has found that LPCs in fragmented habitat in New Mexico and Oklahoma do continue to maintain high levels of genetic variation, increased or prolonged separation of small populations would likely deplete the genetic resources needed to ensure long-term viability.

3.43 Direct Disturbance and Mortality

A number of different influences may result in increased mortality of LPCs, or in disturbance to a degree that reduces breeding success. As discussed in the previous two sections, habitat quality and degree of fragmentation play a primary role in determining how large an impact any potential source of mortality or disturbance will have on a population. LPCs naturally experience a fairly high rate of annual mortality. Potential threats include anything that may add to normal or "background" mortality rates in a population, or reduce that population's capacity to offset losses with new birds produced.

Predation is by far the largest source of mortality for LPCs. Species known to take eggs from LPC nests include Chihuahuan raven, raccoon, striped skunk, ground squirrel, coyote, badger and bullsnake. Species that may prey upon chicks and adult LPCs include red-tailed hawk, ferruginous hawk, golden eagle, Cooper's hawk, prairie falcon, northern harrier, great-horned owl, coyote, raccoon, and fox (Giessen 1998). Predation on eggs and chicks is particularly significant as a factor that may limit population growth. Adult LPCs are also highly vulnerable during lekking, while dispersing to nesting areas, and while incubating eggs. In New Mexico, nearly half of the annual predation on female LPCs occurred during the month of May, and 40% of predation on males occurred from March to May (Wolfe and Patten 2003). In Kansas, of 109 adult LPC mortalities for which a cause was determined, 66% were due to predation by mammals and 19% due to predation by raptors (R. J. Robel, pers. com.). In Oklahoma, 25% of 100 mortalities were attributed to mammal predation and 33% to raptor predation (Wolfe et al. 2003).

Predation rates are influenced not only by habitat quality and availability, but also by changes in native prairie bird and mammal communities. In the northern Great Plains, declines in top-level predators have been associated with increases in potential nest predators and reduced success of ground-nesting species (Garretson et al. 1996). Numerous studies have found higher rates of nest predation on different bird species in fragmented landscapes containing more edge and smaller patch sizes. The introduction of trees, power lines, or other vertical structures into prairie habitats provides hunting perches for raptors and may indirectly increase raptor predation on LPCs (Bidwell et al. 2001).

Fences and power lines may also be a significant cause of direct mortality by collision (Bidwell et al. 2001). Ligon (1951) expressed concern that spread of these features in eastern New Mexico might severely limit LPC populations. Like other prairie grouse, LPCs fly at low elevations and may have limited ability to see and avoid obstacles. The full extent of collision mortality is not known and is difficult to measure as killed birds are quickly removed by scavengers. In Kansas, mortality attributed to power line collisions was only 5% of the total

observed (R. J. Robel, pers. com.). Collision mortality was greater in Oklahoma, where fence collisions accounted for 32%, and power line collisions accounted for an additional 6%, of known LPC mortalities.

The amount of LPC mortality due to vehicular traffic is unknown. Off-road vehicle (ORV) use is largely unrestricted across the LPC range in New Mexico. ORVs are used both by recreationists and by hunters seeking access to hunting areas. Construction of roads for energy development may open up areas to increased ORV use. While data on ORV impacts are lacking, their presence clearly has the potential to disturb lekking and nesting activities. Other potential sources of mortality associated with human activities include trampling of nest sites by cattle, and effects of oil and gas pollution. Legal hunting of LPCs in New Mexico was discontinued in 1996, but poaching or inadvertent take by hunters of other upland gamebird species remains a potential cause of mortality. Disease is not known to be a significant contributor to LPC population declines, but few studies have been undertaken. One recent survey for infectious agents in LPCs in north Texas produced generally negative results (Peterson et al. 2002). While some parasitic infections have been recorded, their population-level significance is unknown. Mote et al. (1999) note that given the generally small and scattered nature of LPC populations, a disease transmitted independently of population density could have drastic effects.

3.5 SDL distribution and status

A form of lizard described as a subspecies of the Sagebrush Lizard was first reported in southeast New Mexico in 1960. In 1992 this taxon was formally recognized as a unique species, the Sand Dune Lizard (*Sceloporus arenicolus*). The SDL is endemic to a small area of shinnery oak habitat in southeast New Mexico and adjacent west Texas. It is the second most narrowly distributed species of any native lizard in North America. The full extent of the species distribution in Texas is unknown, although it includes parts of at least five counties. Knowledge of the historic distribution of the SDL in New Mexico is limited. The historic range is thought to have been larger than the area occupied today. Currently the SDL occurs in parts of Chaves, Eddy, Lea, and Roosevelt counties (see Map 2). Potential and occupied habitat within the species New Mexico range is fragmented, and consists of roughly 650 square miles divided into several distinct geographic areas, separated by significant areas of unsuitable habitat. The overall range in the state is crescent-shaped and about 16 miles wide, extending from the area around Milnesand in Roosevelt County to west of the Mescalero Ridge (Caprock), and southeast to the Texas border south of Hobbs (Painter et al. 1999). About half of the SDL habitat in New Mexico occurs on lands administered by the BLM; important areas also occur on NMSLO lands and private lands. Some 228 square miles (approximately 145,970 acres) of the SDL range falls within the Roswell BLM Core Management Area (CMA), where special management protections exist. See further discussion under 3.8, "Threats to the SDL in New Mexico", below.

Some SDL populations known or discovered in New Mexico since 1960 have decreased or become extirpated. Disappearance of SDL populations from areas that were treated with herbicide to remove shinnery oak was documented by Snell et al. (1997). Painter et al. (1999) estimated that about 25 percent of the total SDL habitat in New Mexico had been eliminated in the previous ten years. These and other reports raised concerns about the effects of increasing

density of surface development on remaining SDL populations. See further discussion under 3.8, "Threats to the SDL in New Mexico", below.

The SDL was recently (2005) upgraded from "threatened" to "endangered" by the NMDGF, and is listed as a sensitive species by the BLM. Since 2001 the SDL has been considered a candidate species for federal listing by the FWS under the Endangered Species Act—see 3.9, "Endangered Species Act considerations," below.

3.6 SDL species ecology, life history and population dynamics

Ecological and reproductive strategies of the SDL are the subject of ongoing studies. In occupied habitat, the SDL may be locally common. It is active between April and September, hibernating in underground burrows during the winter months. The species is diurnal and wary, and tends to stay close to vegetative cover while hunting. Individuals bury themselves in sand to prevent overheating and avoid predators. Thus dune sand is important to the daily survival strategy of the SDL. The species' diet consists of ants, small beetles, crickets, grasshoppers, and spiders (Painter et al. 1999).

Breeding typically begins in late April. Females can reach sexual maturity during their first spring following hatching, and produce one to two clutches per year. Clutch sizes range from 3 to 6 eggs, with older females producing larger clutches. Eggs are buried in sand at a depth of 5-6 inches. Hatchlings emerge from July to September. Dispersal patterns of juveniles and adults are poorly known but are being studied. Recent studies suggest that dispersing juveniles may utilize shinnery oak flats connecting dune complexes (Painter et al. 1999, Painter and Fitzgerald, *unpublished data*).

3.7 SDL habitat requirements

From a conservation perspective, the key biological characteristic of the SDL is the species' highly specific set of habitat requirements. The species occurs only in the microhabitat of sand dune "blowouts" (open, low-lying areas between active dunes) in areas dominated by shinnery oak and scattered sand sagebrush. The species is not found at sites lacking shinnery dune habitat, including shinnery flats, except during dispersal as noted above. Even in dune areas it avoids extensive shinnery patches between blowouts. Studies of SDL activity have shown that larger and deeper blowouts are preferred. Sand grain size may also be a factor, with the SDL appearing to avoid areas of particularly fine-grained sand (Fitzgerald et al. 1997). This may be because small particles interfere with gas exchange through the lizard's skin. Individual SDL's have relatively small home ranges, as indicated by the frequent recapture of marked animals within the blowout of original capture (Painter et al. 1999).

3.8 Threats to the SDL in New Mexico

The principal threat facing the SDL is further habitat loss and/or fragmentation. More specifically, SDL populations may be threatened by activities that remove shinnery oak, alter the dominant vegetative structure, increase the percentage of grasses, disrupt the morphology of sand dunes, or otherwise degrade suitable or occupied habitat (FWS 2004, Painter et al. 1999).

Recent reports and species status reviews by the NMDGF, FWS and others have focused primarily on two types of activity that have affected and continue to affect the status of the SDL: removal of shinnery oak by herbicide application, and surface-disturbing activities including those associated with oil and gas development. Research is ongoing to better understand the longer-term impacts of each.

3.81 Shinnery oak removal

Historically in the Mescalero Sands region of southeast New Mexico, at least 100,000 acres of shinnery oak habitat has been removed by herbicide treatment (Peterson and Boyd 1998). The SDL is restricted to shinnery oak dune complexes, and it is clear that shinnery oak removal results in reduced SDL populations. Research conducted between 1991 and 1995 showed a strong correlation between shinnery oak removal and reductions in the density of SDLs. In a comparison of herbicide-treated and untreated sites, SDL numbers decreased 70-94% in the treated areas. These negative effects were attributed to changes to the vegetative community and dune structure following removal of shinnery oak (Snell et al. 1997). Increased grass cover, dune stabilization, and decreased dune relief are all consequences of shinnery oak removal, and these changes may threaten the persistence of SDL populations. In response to evidence of negative impacts on SDL and LPC habitat, the BLM has discontinued chemical treatment of shinnery oak on lands it administers in southeast New Mexico since 1997. However, the practice continues on private and state lands.

3.82 Development disturbance

Studies to investigate how patterns of oil and gas development in shinnery dune areas may impact SDLs were begun in 1995. Initial studies found an average 37% decrease in SDL abundance in areas within 80 meters of individual oil or gas wells, compared to more distant areas (Sias and Snell 1996). Other studies have looked at the relationship between overall well density and SDL populations. SDLs were found throughout oil and gas fields at all well densities; however, statistical regressions indicated greater impacts to SDL populations as well densities increase (Sias and Snell 1998). Data collected by Sias and Snell (1998) predict a 25% decline in SDL populations when well densities are around 14 wells per section, and a 50% decline at densities of around 25 wells per section.

3.83 Cumulative effects of fragmentation

Cumulative effects of localized disturbances caused by shinnery oak removal or surface development may be spatially widespread population reductions. Shinnery dune habitat may be compromised or lost in areas of high road, rights-of-way, and well densities (e.g. 25 wells per section). Several such areas exist in southeast New Mexico within the range of the SDL (Painter et al. 1999). In some locations, where dense development has existed for several decades, SDL populations persist, albeit in reduced numbers. Thus the species does show some ability to co-exist with surface development activities (Painter et al. 1999). Long-term population effects of existing and additional future development cannot be known with certainty, but biologists and management agencies have expressed a high level of concern.

Additional loss of shinnery oak habitat in certain key areas may have a significant negative impact on SDL population dynamics. In some locations, remaining shinnery oak dune habitat forms a narrow band less than a mile wide. Additional fragmentation in these areas may create

barriers to SDL dispersal and gene flow (Painter et al. 1999). Past management has encouraged directing new development into shinnery oak flats and out of dune areas; however, the discovery that flats may be important to SDL dispersal raises new concerns over development in these areas (FWS 2004).

New mineral leasing has been suspended since 1997 over the significant portion of the SDL's occupied range that falls within the BLM Roswell CMA, limiting the potential for surface disturbance in this region. The CMA includes some 130 square miles of land (approximately 86,810 acres) with unleased federal minerals that fall within the range of the SDL. BLM also requires Plans of Development as a means to assist in mitigating impacts on existing leases.

Other threats

Concentrated Off Road Vehicle (ORV) use may be injurious to SDLs, and may alter sand dune structure. Apart from one designated ORV use area at Mescalero Dunes, ORV use is thought to be relatively limited within the range of the SDL in New Mexico, and significant impacts have not been demonstrated. Use of "thumper trucks" for seismic oil and gas exploration has the potential to crush hibernating lizards and underground nests. No data are available on the extent to which this impact may occur.

Currently there is no evidence that cattle grazing directly threaten the SDL, apart from the associated strategy of shinnery oak removal for rangeland management. Some grazing may help maintain shinnery oak dunes. Populations of SDLs at varying densities are found in grazed shinnery oak pastures. As discussed in section 3.41, livestock grazing does have the potential to alter the vegetative composition and structure of shinnery oak rangelands. How such changes may affect SDL populations remains a subject for future research.

3.9 Endangered Species Act considerations

The Working Group is concerned that both the LPC and SDL are on the candidate species list for federal listing under the Endangered Species Act (ESA). As stated in Chapter One, the goal of the Working Group is to develop and implement conservation strategies that would reduce or eliminate the need for such listing. In this regard, it is important that all parties share an understanding of how legal processes relating to listing and candidate species work, how the FWS views the current status of the LPC and SDL, and how existing conservation efforts are evaluated by the agency at the time a listing decision is made.

3.91 Factors considered for listing

Under Section 4 of the ESA, a species may be determined to be threatened or endangered due to one or more of the following factors:

1. The present or threatened destruction, modification, or curtailments of the species' habitat or range.
2. Overutilization for commercial, recreational, scientific, or educational purposes.
3. Disease or predation.
4. The inadequacy of existing regulatory mechanisms.
5. Other natural or manmade factors affecting the species survival.

The FWS is responsible for evaluating each of these factors and making a public finding on the status of the species with regard to each. In 1995, the FWS received a petition to list the LPC as threatened within its historic range. In 1998, the agency published in the Federal Register its finding that listing the LPC was warranted, but precluded by other listing priorities (63 FR 31400, June 9, 1998). In 2001 a similar finding was published for the SDL.

3.92 Present status: warranted but precluded

Due to the large number of potential listings and the time required to list a species, many listings are deferred due to other, higher priority species. In such cases the species is given a "warranted but precluded" status and placed on the FWS candidate species list. The FWS employs a priority system designed to direct agency efforts toward the plants and animals in greatest need of protection. In this system the degree or magnitude of threat is the highest criterion, followed by the immediacy of the threat and the taxonomic distinctiveness of the species (monotypic genus, then species, then subspecies, variety, or vertebrate population).

In its 1998 ruling on the LPC, the FWS reviewed the population status of the species and information pertaining to each of the five listing factors. Habitat loss and modification were cited as principal factors of concern. While potential conservation benefits of grazing were noted, a need for grazing management that ensures retention of medium and tall grass cover and other structural diversity was emphasized. Overutilization and disease or predation were not considered primary threats, though a possible relation between predation and nest success was noted. Existing regulatory mechanisms were considered, including guidelines present in the BLM's 1997 Resource Management Plan for the Roswell district. This section concluded that "a regulatory mechanism may not exist to ensure development of standards and guidelines that favor LPC habitat needs." Finally, under the "other factors" heading, the ruling noted the sensitivity of LPC populations to drought. The overall magnitude of threats to the LPC were determined to be moderate, but ongoing.

Warranted-but-precluded species require subsequent 1-year findings (Candidate Notice of Review, CNOR) on each succeeding anniversary of the initial petition for listing, until either the species is proposed for listing or a "not warranted" finding is made. The LPC undergoes an annual CNOR; since 1998 its candidate status has not changed. In its annual reviews the FWS issued threat assessments similar to the original finding, focusing on habitat issues and inadequacy of existing regulatory mechanisms. In 2002, new comments were added noting the "recent extirpation of nearly all LPC populations and active leks south of Highway 380 in New Mexico" (FWS 2002). In that notice the FWS stated that it was "very concerned that unrestricted disturbance and landscape fragmentation within large remaining tracts of undeveloped BLM property, coupled with excessive grazing utilization and further weakening of existing policies, may preclude population recovery on BLM lands in southeastern New Mexico."

The SDL was ruled warranted but precluded for federal listing in 2001. In its most recent (2004) candidate species assessment for the SDL, the FWS focused on habitat loss or modification, and the inadequacy of existing regulatory mechanisms. The report notes that oil and gas development in southeast New Mexico has accelerated in recent years, and cites specific areas of

concern in Lea County. The FWS states its concern that considering the SDL's small geographic range, "the magnitude and imminence of threats, and the vulnerability of extant localities, the lizard is likely in danger of extinction in all or a significant portion of its range" (FWS 2004). The report notes the reduction in shinnery oak removal under current BLM policies, but also the lack of an agency plan that address threats to the species or specific conservation and recovery needs. Additionally, there are no local or state regulatory mechanisms pertaining to SDLs on state and private lands (FWS 2004).

3.93 Policy for the Evaluation of Conservation Efforts (PECE)

The FWS supports the development of conservation efforts designed to reduce or eliminate threats to candidate species. Recently the FWS issued a new Policy for Evaluation of Conservation Efforts (PECE). PECE is applied when listing decisions are being made, to evaluate whether formalized conservation efforts may be sufficient to make listing unnecessary, or to warrant listing as threatened rather than endangered. Under PECE, the FWS will evaluate whether ongoing and anticipated efforts to conserve a candidate species, such as may be described in a conservation agreement or plan, are sufficient to improve the status of the species with regard to the five listing factors specified in the ESA. This evaluation is based on two broad standards: certainty of implementation and certainty of effectiveness.

Criteria for evaluating certainty of implementation include identification of all parties, funding sources, and other resources required; establishment of the legal authority of parties to implement the agreement; demonstration that all regulatory mechanisms and procedural requirements will likely be met, and that all needed authorizations and permits will be acquired; and demonstration with a high level of certainty that there will be voluntary participation and funding necessary for implementation.

Criteria for evaluating certainty of effectiveness include description of the nature and extent of threats being addressed, and of how the conservation effort reduces them; explicit incremental objectives for the conservation effort; identification of the steps necessary to implement the conservation effort; specification of quantifiable, scientifically valid parameters that will demonstrate achievement of objectives; provisions for monitoring and reporting progress; and incorporation of principles of adaptive management.

As PECE demands, the conservation strategies presented here for the LPC and SDL take many forms and address a variety of threats to the species. Some describe efforts already well underway; others will require additional planning with a focus on funding and implementation. Some present general recommendations that may be further elaborated and formalized in other plans and agreements. Taken as a whole, the Working Group believes that the set of efforts described in the next chapter represent a significant step toward meeting PECE criteria. These efforts will significantly reduce or eliminate threats that might otherwise lead to federal listing of the LPC and SDL in New Mexico.

Chapter Four: Lesser Prairie-Chicken Conservation Strategy

Introduction

The strategies and recommendations presented in this chapter have been crafted by the Working Group with FWS listing factors and PECE criteria in mind. The strategic approach aims to be comprehensive, addressing each principal area of LPC conservation need in a series of "pathway" sections (explained below). At the same time, it should be emphasized that this is a broad-scale statement of recommended strategies, not a detailed operational plan for LPC conservation. The strategy sections lay out general approaches, priorities and parameters for achieving the goal of LPC conservation and recovery while maintaining economic values and traditional land uses. For some strategies, negotiations required specification of a greater amount of operational detail. In every case, however, further details of planning and implementation remain to be worked out. This work must continue in a variety of contexts, by the different agencies through their own planning processes and by an ongoing advisory group or groups with stakeholder representation.

This chapter offers a strategic foundation upon which future operational planning efforts can be established and coordinated. (Chapter 5 suggests some directions this next round of work might take.) The Working Group considers it essential that future conservation work be directed toward carrying out the strategies presented here, around which broad consensus has been reached.

The conservation strategies are preceded in this chapter by important sections that explain the pathway approach, the three planning regions to which various strategies refer, and the landscape analyses upon which some strategies are based. Equally important is the discussion of "prerequisites" that the Working Group has identified as being essential to achieving conservation and land use goals.

4.1 Strategy orientation: conservation pathways

Following from the discussion of threats in Chapter 2, the overall conservation strategy for the LPC is organized around a series of "pathways" for conservation or management action. While each contains an implied objective, the word "pathway" was chosen to emphasize a flexible and multifaceted approach toward meeting conservation and land use goals.

Pathways 1-5 are intended to focus current and future conservation efforts around several key issues that, based on current knowledge of biological requirements and threats to the species, have the greatest and most direct bearing on survival and recovery. For the LPC these include efforts to increase recruitment by management and enhancement of rangeland habitat, minimize habitat loss and fragmentation due to development, establish a reserve network on a landscape scale, reintroduce populations into portions of the historical range, and provide protections from direct mortality or harassment. Within each of the five conservation pathways a number of

specific strategies (for the most part management practices or projects) are identified that the group believes will be both feasible and effective in reducing threats. These are presented under each numbered pathway in decimal form: Pathway One includes Conservation Strategies 1.1, 1.2, etc.

Pathways 6-9 describe areas where coordinated support is needed to increase the precision, effectiveness, and scope of on-the-ground conservation efforts. These include strategies for research and monitoring, education and outreach, planning and adaptive management, and securing funding. Collectively, the pathways reflect and represent the progress of the Working Group to date, both in identifying conservation priorities and in reaching a broad consensus as to priority actions and stakeholder or agency responsibilities. They provide the framework upon which more detailed action plans and implementation strategies can be based.

4.2 Planning regions and management priorities based on population status

The pathways describe a coordinated but multifaceted approach to LPC conservation. Biological and land use issues vary from region to region across the planning area, and different strategy elements will assume greater or lesser importance in different locations. In order to facilitate management planning and prioritization, for some strategies the Working Group has adopted a regional approach, based on the three-part division of the LPC historic range described in Chapter 3. Although this scheme describes differences in the status of LPC populations— isolated, sparse and scattered, or well-distributed—lands in the different categories occupy (for the most part) geographically distinct areas, with differing characteristic patterns of land ownership and use (see Map 3). This division is made even more explicit in strategy 2.1, which presents recommended guidelines for mineral leasing in each of the three areas. In other sections, broad strategies are described that may apply generally over all three planning regions.

1. **Well-distributed** LPC populations occur in a **Primary Population Area (PPA)**, situated north of Highway 380 and (mostly) south of New Mexico Township 5 in north Lea, south Roosevelt and northeast Chaves counties. (The PPA surrounds all but the southernmost portion of the Roswell BLM's Core Management Area.)

2. **Sparse and Scattered Population Areas (SSPA)** are areas where leks have become sporadically distributed, and where the species may be facing local extirpation. These occur in the area north of the PPA, primarily in north Roosevelt and Curry counties with small portions of east De Baca and south Quay counties, and also in southeast Chaves county south of Highway 380.

3. An **Isolated Population Area (IPA)** exists in the southernmost portion of the LPC's historical range, in Lea and Eddy counties. In this area the LPC is considered extirpated, or nearly so. For convenience this region is sometimes referred to as the **Carlsbad Area**. (Other portions of the former LPC range in northeast New Mexico, where populations have been extirpated in recent historical time, remain of concern but have been largely beyond the scope of the present Working Group effort.)

A regional planning approach based on differences in population status helps to prioritize management actions and the allocation of conservation resources in different areas. The Working Group recommends that the following guidelines be considered:

- Sparse and scattered population areas should be considered highest priority for management efforts to locate, monitor, and protect existing leks and surrounding habitat, and to establish new LPC reserve sites.
- Portions of the IPA should be considered high priority for expanded surveys, habitat improvement, and reserve site establishment.
- Areas where LPC populations remain well-distributed should be viewed as high priority for ongoing habitat protection, maintenance and enhancement in conjunction with ongoing economic land uses, and for research to develop or test the efficacy of new management practices.
- In addition, any areas where LPC populations or suitable habitat face imminent threats of habitat conversion or development should be considered highest priority for strategies aimed at preventing habitat loss or minimizing development impacts.

4.3 Landscape analysis

As the Working Group began its deliberations, it soon became clear that the scope, effectiveness, and impacts of different strategy options could not be fully assessed without precise and up-to-date knowledge of existing conditions in the planning area. Thus, an essential step towards meeting Working Group goals has been the development of an increasingly detailed analysis of existing land status and use across the three planning regions. Much progress has been made in this effort, with significant contributions by the BLM, NMDGF, SLO and the New Mexico Natural Heritage Program. Further survey, site-assessment, and mapping efforts are ongoing.

Landscape analysis is facilitated by the use of GIS technology for compiling and mapping different types of information. The main categories of information considered in the Working Group's conservation planning effort include land and mineral ownership, species distribution, and distribution and quality of habitat.

Land ownership and surface and mineral lease status

The planning area is a complex matrix of private, state, and federal lands, with active grazing and mineral leases administered by both the BLM and the SLO. In some areas surface and mineral ownership rights are under separate authorities, resulting in a "split estate". Different combinations of land and mineral ownership, lease status, and use present different possibilities and constraints for conservation planning.

LPC distribution

Because LPCs return each year to traditional known lek sites, it is possible to map the distribution of occupied habitat with some precision using data gathered from ongoing annual surveys. In some areas, however, (particularly on private lands) survey effort has been insufficient to detect all active leks. There is also some turnover from year to year as new lek sites become active and old ones become inactive. For planning purposes it is important to have

as thorough and current a representation as possible of where LPC leks are located, drawing from all relevant sources of survey data. This is particularly important in assessing the effects of specific policy recommendations that apply to occupied habitat areas around lek sites. To create as complete a picture as possible of LPC distribution in New Mexico, the Working Group recommends increased survey effort in some areas to locate all active leks, and information sharing among all entities carrying out LPC surveys and/or administering survey data.

Distribution and quality of habitat

The value of any habitat area to LPCs is determined by a combination of natural conditions, which vary through time and space, and the existing legacy of surface disturbance or development impacts. The central and most challenging component of landscape analysis is the detailed depiction of habitat in terms of degree of surface disturbance and current or potential conservation value.

On the broadest scale, LPC habitat is defined by the natural distribution of appropriate vegetation types: shinnery oak grasslands and dunelands, and sand sage grasslands. However, much of this habitat has been impacted—to varying degrees—by past land use practices including herbicide treatments of shinnery oak, and different forms of development. Surface disturbance, alteration, and fragmentation all may reduce habitat quality to a degree that may reduce or preclude occupancy by LPCs (see Chapter 3, Threats to the LPC in New Mexico).

Landscape analysis efforts currently under way are directed towards synthesizing all available information on species distribution, surface disturbance, and habitat quality across the three planning regions. The purpose of such analysis is to help identify areas where different conservation strategies may be most feasible and useful, and areas that may be of less importance to conservation where development may be a higher priority.

In the PPA, a complete map of vegetative cover types, based on satellite data and ground surveys, has been created by the New Mexico Natural Heritage Program (NMNHP) and the Earth Data Analysis Center (EDAC) at the University of New Mexico. LPC leks and various surface infrastructure features are also included. This map is central to the Working Group's recommendations for mineral leasing in the PPA (see Conservation Strategy 2.1) and will be updated periodically. Planning has also drawn on maps produced by the BLM in undertaking habitat suitability analyses for the LPC in the Roswell and Carlsbad districts. In the Carlsbad area, analysis has led to preliminary identification of habitat areas that may be important for future restoration and recovery efforts.

Negotiations over the PPA led to a division of lands into four defined categories (see Conservation Strategy 2.1). While the same level of analysis has not yet been undertaken in the other two planning regions, the following terms are used throughout and reflect the basic biological template of the LPC's historical range in New Mexico.

- 1. Unsuitable habitat** describes areas lying outside any of the shinnery oak or sand sage vegetation types used by LPCs for nesting and brood rearing.
- 2. Potentially suitable habitat** describes unoccupied areas within an appropriate vegetation type with varying levels of development and/or fragmentation; most has recovery potential.

3. Suitable habitat describes unoccupied areas within an appropriate vegetation type, with minimal development or fragmentation impacts.

4. Occupied habitat describes all areas within 1.5 miles of active lek sites, regardless of vegetation.

Note that these terms do not address variation in habitat quality as may occur from year to year and from location to location due to factors such as rainfall and grazing management. Areas of suitable habitat may differ greatly in terms of rangeland condition and habitat quality. Further specification of habitat quality is provided in Pathway One. A more precise distinction between suitable and potentially suitable habitat is provided in Pathway Two.

While this classification scheme is useful as a tool for planning and setting policy guidelines, it is based on broad-scale survey data that may not fully capture existing conditions at different locations on the ground. It is understood that further, site-specific evaluation of conditions will often be needed, particularly in cases where management decisions may be contingent upon a determination of habitat suitability or occupancy.

Further applications of landscape analysis are discussed in conservation strategies 2.1 and 3.4.

4.4 Prerequisites for stakeholder support and implementation

In Working Group deliberations over different conservation strategies, certain requirements were repeatedly mentioned as being critical to success. These are addressed in terms specific to each pathway and conservation strategy in the sections to follow. More generally, however, the group would like to highlight the following elements as being broad in scope and vital to the attainment of many or all pathway objectives. As such, these elements should be considered prerequisites to effective development and implementation of the entire Conservation Strategy for the LPC and SDL. *Every effort must be made to ensure that the following conditions are met, for all strategies and in all geographic areas where strategies are being pursued.*

- **Landowner assurances.** To gain the support and cooperation of private landowners for conservation efforts on both private and public lands, management agencies—in particular the FWS—must provide protections to landowners such that voluntary conservation actions do not lead to penalties or other restrictions in the event of state or federal listing. Mechanisms for providing such protections exist, but may be poorly understood or viewed with skepticism by landowners. It is in the interest of all parties that landowners be fully aware of all the options and legal assurances available to them, and that the FWS facilitate the establishment and signing of these agreements. See also Conservation Strategy 3.4 regarding Candidate Conservation Agreements with Assurances.
- **Incentives for voluntary conservation efforts.** While CCAAs, Safe Harbor agreements, and other programs remove a powerful disincentive for landowner participation in species conservation and habitat improvement efforts, this is not sufficient. Many of the strategies described in this document, such as more conservative grazing management to improve habitat quality for LPCs, carry costs which must be offset to ensure voluntary participation. Stewardship values, rangeland improvement,

and a sense of personal responsibility all may provide strong incentives for instituting management practices that will benefit threatened wildlife. However, even where these values and motivations exist, economic considerations make the existence of financial incentives to offset costs essential to securing private landowner support for, and involvement in, this conservation effort.

- **Agency focus and flexibility.** Successful implementation of this conservation strategy will require the full support of land management agencies, from the highest organizational levels to regional or district offices. In particular, the BLM, NRCS, NMSLO, and NMDGF must have a capacity to prioritize LPC and SDL conservation across organizational and divisional boundaries, streamline decision-making and process requirements related to strategy implementation, show flexibility in pursuit of overall policy objectives, and devote sufficient resources to carry out strategy recommendations, including ongoing monitoring, planning, and adaptive management.
- **Goals and standards.** All conservation efforts should be undertaken with clearly stated goals and agreed upon standards for monitoring outcomes. Goals and standards presented in this document may serve as a beginning, but for many strategy elements more specific criteria need to be developed.
- **Planning for success.** Implementation must proceed with a clear expectation that strategies will be pursued for as long as necessary to secure LPC and SDL populations, but not beyond the point of necessity. Private parties who willingly assume responsibility to carry out actions or enter agreements described in this or future strategy documents should be assured that requirements may become less burdensome as goals are achieved.
- **Leadership.** Continued leadership is required from all members of the Working Group, to advocate full support for this Conservation Strategy from each member's respective agency, industry, or conservation constituency. Only with the full support of these larger constituencies can the goals of the Working Group and this document be realized. Leadership in building individual and private organizational support for efforts on both private and public lands is particularly important.

4.5 Objectives for the conservation strategy

The Working Group recognizes two broad sets of objectives for its Conservation Strategy:

Conservation objectives

Establish and maintain healthy, self-sustaining populations of LPC and SDL in sand shinnery and sand sage-grassland communities of southeastern and east-central New Mexico, through habitat preservation and improvement, species protection, and other measures, such that inclusion of these species populations in any future listing actions under the Endangered Species Act is not needed.

Land use objectives

Achieve species and habitat conservation through cooperative problem-solving among stakeholders, continued, new or expanded programs of agencies and NGOs, voluntary commitment to implementation of recommended practices, and ongoing adaptive management such that traditional land uses are maintained and human livelihoods are protected.

Pathways to achieve these goals follow. Direct, on-the-ground conservation efforts are described in Pathways 1-5. Additional support strategies for conservation success are described in Pathways 6-9.

Pathway 1: Increase seasonal habitat quality and LPC recruitment on rangelands and CRP lands

- Conservation Strategy 1.1: Conservative grazing management in important habitat areas, with compensation for ranchers
- Conservation Strategy 1.2: Enhanced CRP management
- Conservation Strategy 1.3: Mesquite control
- Conservation Strategy 1.4: Shinnery oak management

Pathway overview: Opportunities and challenges

The most direct and effective means of improving the population status of LPCs in New Mexico is to enhance characteristics of rangeland habitat needed for successful nesting and juvenile recruitment. Such an approach takes advantage of the LPC's inherent biological capacity for population increase; whenever and wherever annual mortality can be limited by the presence of suitable vegetation. This pathway focuses on improving the quality of suitable and potentially suitable habitat for LPC nesting and brood rearing, in areas around active lek sites or where known leks have existed in the past. It is concerned primarily with the management of vegetation on rangelands and CRP fields. Development-related impacts on LPC habitat are addressed in Pathway 2.

As discussed in the previous chapter, grazing and drought have historically been dominant ecological forces throughout the sand-shinnery and sand sage-grassland ecosystems. Grazing is not considered to be incompatible with healthy LPC populations, and in fact may be an important tool in managing for species protection and recovery. A central challenge however is to ensure that, in areas where LPC leks are present, grazing occurs in a manner that allows suitable nesting and brood-rearing habitat to be maintained (Applegate and Riley 1998, Bidwell et al. 2001, Jamison et al. 2002). An equal challenge is to achieve these safeguards for LPC habitat without negatively impacting the economic interests of ranchers and ranching communities.

The Working Group has identified a set of strategies for preserving habitat quality and boosting LPC recruitment on rangelands and CRP lands. The conservation benefits to be achieved are cumulative across the range of the species in New Mexico, but different strategy elements or combinations of elements may apply in different locations. The rangeland habitat of the LPC is spread across a matrix of federal, state, and private lands, and different management tools and funding mechanisms are required for each. However, all these efforts should be guided by, and revolve around, a common set of standards for defining habitat quality. The technical committee of the Working Group has proposed a set of standards, which describe "high quality" nesting and brood-rearing habitat in terms of vegetative composition and structure (see Definitions and Standards below). These standards may be used to set goals for, and evaluate the success of, management efforts.

The Working Group's mission has been to devise conservation solutions for the LPC that protect the interests of property owners and land users. The group understands that the economic balance of many ranching operations is precarious, and may be upset if forced restrictions on

grazing operations are imposed. Failures may lead to the sale and potential development or conversion of important habitat areas. For these reasons it is considered essential that needed reductions or changes in grazing regime, specifically to benefit LPCs and other at-risk wildlife species, be accompanied by fair compensation to ranch operators, or be achieved through a program that provides stewardship incentives to voluntary participants. To be truly successful, any such program must be able to guarantee a secure source of long-term funding. It is equally essential that contractual assurances be made available to private landowners participating in a conservation program, such that their economic interests are protected should listing occur.

Alongside compensation or incentive-based programs for livestock reduction, several other strategies can help achieve the combined goals of improving habitat for LPCs, reducing grazing pressure on sensitive areas, and maintaining the economic security of ranchers. These include enhanced management of CRP lands, enrolling additional cropland into the CRP, inter-seeding desirable grasses and forbs into native rangelands, mesquite control to improve both LPC habitat and livestock forage, and limited use of herbicides to control shinnery oak where conditions warrant. All are considered here as elements of a single conservation pathway directed towards meeting the biological and economic requirements of LPC habitat enhancement on rangelands in eastern New Mexico.

Definitions and standards

Management to provide or maintain optimal conditions for LPC nesting, brood-rearing, foraging and concealment requires a set of target standards specifying vegetative composition and grass height (visual obstruction). Based on work by the five-state LPC working group, and other studies, the technical committee of the Working Group has agreed on the following description and standards for quality habitat.

Habitat description

A number of different shrubland and grassland vegetation types with a shinnery oak or sand sagebrush component are considered habitat for LPCs. Habitat vegetation exists across the historical range of the species, wherever rangeland has not been highly altered or converted to other uses. In the PPA, satellite imagery (along with some ground truthing) has been used to map the distribution of all vegetation types constituting suitable or potentially suitable habitat (see Landscape Analysis, above, and Conservation Strategy 2.1 below). Habitat suitability analysis and mapping also is ongoing in the Carlsbad area and portions of the Sparse and Scattered Population Area.

Plant community characteristics of suitable or potential LPC habitat can be described using the system of range-site classification developed by USDA/NRCS. The following NRCS Ecological Range Site categories vary slightly in plant composition, but share a common set of vegetative characteristics considered necessary for LPC habitat: Deep sand CP-2, SD-3 & Hp-3, sandhills CP-2, SD-3, & HP-3, sandy plains CP-2 & Hp-3, and loamy sand SD-3 & HP-3.

Standards for vegetation

The following standards for plant composition and grass height describe *high quality* habitat within the sand shinnery and sand sage - grassland ecosystems. Areas that fail to meet these

standards should not necessarily be considered unsuitable for LPCs. In some areas populations persist in habitat of poor or marginal quality, and these areas should be considered of great conservation importance. In these locations, survival and recruitment are likely to be increased if habitat conditions are improved to meet vegetative standards. In areas where populations have disappeared due to deterioration or elimination of high quality habitat, long-term recovery may be needed to meet habitat goals. In such areas, the focus of management should be on maintaining consistent progress towards meeting the vegetative standards.

- Quality LPC habitat should have an average canopy cover of 30-50% grasses, 25-40% shrubs, and 3-10% forbs; with no more than 42% bare ground and litter.

Standards for concealment cover

A site may provide suitable vegetative composition but lack the vertical structure required for successful nesting and concealment. A consistent method should be employed to assess the vertical structure of nesting cover across the range of the LPC. The technical committee recommends using the Robel pole visual obstruction technique (Robel et al. 1970). Sampling transects of pasture using the Robel method in the early spring (mid-February to early April), prior to the leafing out of shinnery oak and immediately prior to nesting, provides a standardized measure of the average height of residual grasses favored by LPCs for nest placement.

- The standard set by the technical committee is that at least 10% of all survey points should provide a Robel visual obstruction reading of at least 13 inches. (Note that by this standard, actual grass height will be something greater than 13 inches.)

Conservation Strategy 1.1: Conservative grazing management in important habitat areas, with compensation for ranchers

Description

This is a broad-scale strategy to ensure that grazing is maintained at a level consistent with the seasonal nesting and brood-rearing habitat requirements of the LPC, as defined by vegetative standards stated above. Ranch operators voluntarily participating in a compensation program would agree to try to meet these standards through the adoption of a suitable grazing program for their land or lease allotment. Such a program may involve an overall reduction in AUMs or acreage grazed, modification of fences and water sources, implementation of a more conservative, deferred or rotational grazing system that rests breeding areas in critical seasons to ensure adequate residual grass cover for nesting, and other related changes in management. *Support of the ranching community for this strategy is contingent upon the availability of adequate compensation and funding.*

LPCs nest during April and May, primarily in residual grass cover consisting of growth from the previous summer. Brood rearing usually occurs from April until late July. Thus, conservative grazing is necessary from August to June to provide quality nesting habitat, and on through July for brood rearing. (Bidwell et al. 2001, Giesen 1998, Riley et al. 1992). Vegetative standards should be specified in lease agreements, along with periodic monitoring and assessment over time to guide the application and refinement of the program until objectives are reached. The

precise grazing regimen that may be needed to achieve these standards may differ from location to location, and is best determined by ranch operators in consultation with agencies on a case-by-case basis.

In return for participating in the program, ranchers should receive fair compensation for costs stemming from reductions in AUMs or other changes in grazing practices undertaken to achieve LPC habitat improvement. The amount of compensation should be sufficient to form an adequate incentive for participation, and should be re-evaluated periodically. Environmental Quality Incentives Program (EQIP) funding estimates may be necessary for distinguishing reductions associated with LPC conservation from those that may be otherwise necessary due to drought conditions. Compensation should be available to include the entire ranch area affected by the change in management, regardless of land status.

Operators on private and state lands participating in such a program would be encouraged to enroll in a **Candidate Conservation Agreement with Assurances (CCAA)** with the FWS (see conservation strategy 3.4). A CCAA provides protection from any additional regulatory obligations or restrictions on non-federally-owned lands in the event of federal listing of a candidate species, such as the LPC or SDL. Under existing law guaranteed protections are not available prior to species listing on federally leased lands. However, the FWS can and should commit to honoring the terms agreed to in a CCAA across entire ranch operations containing a mix of private, state and federal lands. This can be facilitated if operators adjust the standard grazing plan for their allotment to reflect the terms of the CCAA. Should listing occur, formal protections can be extended through completion of a Safe Harbor agreement or Habitat Conservation Plan (HCP) with the FWS.

While a variety of compensation mechanisms may be employed (see "Funding", below) this strategy will be successful only if several conditions are met. It is important that management agencies including the BLM, NRCS, NMDGF and NMSLO assume responsibility not just for administering the incentives program, but also for providing or coordinating ranch management consultation to assist each participant in devising a suitable grazing regime, and to work with lessees and private landowners to improve habitat and meet vegetative standards. While the purpose of incentives is more conservative grazing, agreements should also address maintenance of fences, water sources, and other improvements. Implementation of this strategy should take into account any agency provisions regarding special management areas, such that all operations subject to formal restrictions on grazing also qualify for compensations.

Conservation benefits

Loss of high-quality habitat for nesting and raising chicks is thought to be a primary driver of LPC population declines. This effort will increase the extent of shinnery-oak and sand sage - grassland habitat that meets vegetative standards for successful nesting and brood-rearing, particularly in key areas, without imposing financial hardship on ranchers.

Evaluation

Success of grazing management practices for LPCs should be monitored and evaluated by annual counts of birds attending nearby leks, and if possible, counts of broods and chicks per brood in summer.

Project Area(s)

This strategy may apply in any areas of suitable or potentially suitable habitat. High priority locations for habitat improvement are areas where LPC populations are considered sparse and scattered and throughout the PPA.

Priority Assessment and Special Considerations

Highest priority. This strategy has the potential to improve LPC habitat and increase recruitment on a broad scale in New Mexico. The Working Group believes this should be a marquee initiative, and is one that can showcase the effectiveness of government-private party partnerships in carrying out habitat-based, incentive-driven species conservation.

This effort relies on the voluntary participation of ranchers. In implementing this strategy it is important to secure funding that is long-term, such that participants are protected from unexpected or abrupt termination. It is important to note that, while incentives are a key component of this strategy, conservative grazing also is in the long-term economic interests of ranchers. Such strategies can help maintain rangeland productivity through changing climatic conditions, and are consistent with stewardship responsibilities upheld by individual ranchers and the grazing industry in New Mexico.

Parties Responsible

BLM, NRCS, NMSLO, NMDGF, private parties. The Range Improvement Task Force may serve as conflict mediator. The Eastern Plains Conservation Coordinator (see Pathway 8) would help coordinate efforts among agencies and private parties. The NRCS, FWS, NMDGF and other agencies would help publicize the effort and inform ranchers about habitat and management needs of the LPC (see Pathway 7).

Parties Affected

Ranch operators and private landowners. Holders of BLM or NMSLO grazing leases. Possibly counties through reductions in tax revenues on livestock.

Funding

Funding for a compensation program may be provided by a number of different mechanisms. Several established federal- and state-sponsored funding programs provide support for habitat maintenance and improvement. These include Farm Bill programs such as the Environmental Quality Incentives Program (EQIP), the Wildlife Habitat Incentives Program (WHIP), the Grassland Reserve Program (GRP), and various wildlife habitat programs administered by the FWS or the NMDGF.

Of these, EQIP may be the program with the greatest capacity to provide compensation for conservative grazing management over a wide area. Three NRCS offices in New Mexico currently employ this program for LPC habitat management, including compensation for deferred grazing, infrastructure improvement, and habitat restoration. While in the past, EQIP has been limited to projects carried out on non-federal lands, program funding has recently become available in New Mexico for federal lands improvements. Such funding is essential for operators whose holdings include both private and public lands to fully participate in

recommended strategies for LPC habitat management. The Working Group strongly supports increased availability of EQIP funding, including the continued availability of funding for habitat improvements on federal grazing allotments in New Mexico.

On federal and state lands, incentive programs by surface management agencies are another primary means of carrying out this strategy. The NMSLO's Rangeland Stewardship Incentive Program (RSIP) offers a 25% reduction in grazing fees to qualifying lessees who voluntarily manage their operations to improve grass cover and range condition. Evaluations are made by a qualified range specialist at the outset of the agreement, and every five years thereafter. Lessees must apply through the SLO one year prior to lease renewal. BLM also has a program for non-use grazing permits, available on an annual basis when the primary objective of authorized grazing use or conservation use is the management of vegetation to meet resource objectives other than the production of livestock forage, to conduct scientific research or administrative studies, or to control noxious weeds.

On a larger scale, programmatic funding to support this strategy may become available through agency budgetary allocations or through a special funding mechanism approved by Congress or the New Mexico State Legislature. Additional information on current funding programs and strategies is available in Pathway 9.

Conservation Strategy 1.2: Enhanced CRP management

Description

Some lands enrolled in the USDA's Conservation Reserve Program (CRP) provide an important management opportunity for increasing and improving LPC habitat. Past management of CRP lands has favored planting of grasses that provide little habitat benefit for LPCs. This effort would redirect CRP management in strategic areas through mid-contract management by re-seeding an appropriate mix of primarily native species—including tallgrass and forb species important to LPC nesting and brood rearing—and through the limited use of managed grazing on CRP lands. (Management agencies also should consider possible use of non-native species that would provide suitable vegetative structure for LPC habitat, as exemplified by the recent successful use of alfalfa in habitat improvements on CRP in Kansas.) Grazing on a limited basis (such as once every three years) would be used to stimulate the formation of desired vegetative structure within the CRP, and to provide forage in order to reduce pressure on other key habitat areas.

Most CRP contracts are for 10 years, and the implementation of a new management prescription is easiest when contracts are entered into or renewed. However, opportunities for mid-contract changes in management are allowed under the program. As part of this strategy, the Working Group recommends the development of mid-contract management guidelines for CRP lands in LPC habitat, such that habitat improvements can begin as soon as possible. The current Farm Bill also allows for exceptions to CRP acreage limitations, such that counties may be granted a special amount of additional acreage beyond the normal program maximum. The Working Group recommends that such an exception be pursued for counties currently at their CRP limit (25% of cropland), in order to create new areas of LPC habitat. This may be particularly

important in Roosevelt County, where CRP currently is at a maximum and where habitat losses due to agricultural development are continuing.

Critical to this strategy's success will be an administrative capacity and willingness to work within and/or modify existing CRP guidelines, in order to establish re-seeding and grazing programs designed for LPC habitat improvement. Equally critical will be a coordinated effort to build support and participation among private landowners already enrolled in, or potentially eligible for, CRP.

Conservation Benefits

This effort will help achieve vegetative standards for LPC habitat on private lands, and may help increase the total available area of suitable habitat. Under the proposed alternative CRP management practices, native grass and forb growth should increase on both CRP lands and, due to the availability of additional forage, on adjacent private rangelands. These changes will increase the quality and extent of LPC nesting and brood-rearing habitat, and provide additional food resources for the species. Local-scale habitat improvements achieved through this and other efforts will help restore connectivity between core and isolated LPC populations. In keeping with the overall mission of CRP, habitat improved and restored by this strategy may be expected to provide long-term benefits.

Evaluation

Success of CRP management for LPCs should be monitored and evaluated by annual counts of birds attending leks on or near affected lands.

Project Area(s)

CRP eligibility is limited to lands with a recent cropping history. CRP lands and croplands that may be affected by this effort are concentrated in the northern portion of the planning area, in east-central New Mexico. The primary focus should be on CRP lands within important habitat areas and areas of sparse and scattered populations. Implementation of this effort will occur on currently enrolled CRP fields, and on those that in the future may enter into CRP contracts. Roosevelt and Curry counties already contain their maximum allowable acreage in CRP.

Priority Assessment and Special Considerations

High priority. Enhanced CRP management may be a significant means of restoring LPC habitat on private lands. In such cases, landowners would be encouraged to seek enrollment in a Candidate Conservation Agreement with Assurances with the FWS (see Conservation Strategy 3.4). An emphasis should be placed on increasing the extent of CRP-eligible lands as permitted under the Farm Bill, and to establishing guidelines for making management changes on existing CRP contracts. On any CRP project undertaken in an area bordering Sand Dune Lizard habitat, consideration should be given to the needs of that special status species.

Parties Responsible

CRP is administered by the Farm Service Agency (FSA), with technical support from the NRCS. Assistance with coordination of landowner enrollment and conservation planning may be provided by NRCS staff and/or the Eastern Plains Conservation Coordinator (see Pathway 8).

Parties Affected

Private landowners who are eligible for CRP. Also, potentially, non-participating landowners who may not support LPC conservation efforts in their area.

Funding

CRP program funding, possibly leveraged with private cost-share funds.

Conservation Strategy 1.3: Mesquite control

Description

Mesquite encroachment into sand-shinnery and sand sage ecosystems reduces the amount of forage available for grazing, and creates habitat that is not suitable for LPC nesting or brood-rearing. Mesquite control may be used to improve rangeland health in areas not used by LPCs, thereby reducing pressure in nesting areas. This also can help offset forage losses due to initiation of conservative grazing on other ranch lands that are important LPC habitat. Thus, mesquite control is a valuable management tool from both a conservation and a livestock industry perspective.

This strategy calls for a program of mesquite reduction or eradication on rangelands containing or adjacent to LPC habitat. On federal land, BLM personnel would identify priority areas for control projects and carry out treatments in coordination with other interested agencies and permittees. On state lands, NMSLO staff, in cooperation with BLM, would work with lessees to secure funding and assist with treatments. Mesquite control on private lands would be undertaken at landowner initiative, with incentives provided by NRCS, and perhaps by NMDGF. Mechanical and chemical treatment would be used in accordance with NRCS standards and specifications for brush management. NRCS ecological site descriptions provide plant communities for sites based on soil type. Mesquite control may be carried out in concert with other efforts to enhance rangeland management for both grazing management and successful LPC recruitment.

While mesquite is here singled out as the predominant invasive shrub affecting the health and habitat quality of rangelands in southeast New Mexico, consideration also should be given to control of cholla or other invasive shrubs where such actions may increase rangeland productivity and alleviate pressure on LPC nesting and brood-rearing habitat.

Conservation Benefits

Mesquite eradication can improve overall watershed health by increasing grass production and water retention, and reducing the amount of bare ground. LPCs would benefit from the presence of additional forage, which allows the redistribution of livestock away from areas of sensitive nesting habitat and brood-rearing habitat. Where mesquite is eliminated, renewed plant succession may lead to a return of native shinnery oak, sand sagebrush, tallgrass species and forbs, allowing LPC range expansion into currently unoccupied and unsuitable habitat areas.

Evaluation

Vegetative response in treated and untreated areas should be carefully monitored using standard protocols. Where applicable, LPC response should be monitored and evaluated by

annual counts of birds attending leks on or near affected lands, and by conducting brood counts in summer where and when possible.

Project Area(s)

Mesquite control should occur in all areas of shinnery oak and sand sage habitat where encroachment is occurring, throughout the occupied range of the LPC in New Mexico. A high priority for this and other habitat improvement projects should be areas where LPC populations are sparse and scattered. Control may be beneficial in any part of the historic range where mesquite invasion has accompanied surface disturbance, and in areas where the shrub is visually intrusive.

Priority Assessment and Special Considerations

High priority. Where needed, mesquite control may be a simple and effective means of providing forage in areas less favored by LPCs, and of improving or adding to potential habitat areas for population expansion. On private lands, mesquite control may be part of a CCAA between the landowner and the FWS (see Conservation Strategy 3.4).

Parties Responsible

Primary responsibility will be with the surface management entity: BLM, NMSLO, or private landowners. Each should seek assistance and technical support from NMDGF and NRCS.

Parties Affected

Private landowners and holders of state or federal grazing leases.

Funding

EQIP and other Farm Bill funding is available for mesquite control as part of habitat improvement. BLM Rangeland Improvement Funds may be available for projects on federal lands. The NMSLO contributes survey and monitoring efforts in federal partnership programs (such as EQIP) affecting state lands. See Pathway 9 for a description of potential funding sources.

Conservation Strategy 1.4: Shinnery oak management

Description

Herbicides and defoliants sometimes are used to reduce shinnery oak cover and increase forage production. The effects of this practice on LPC habitat may be highly variable, depending on the manner and extent of treatment. Shinnery oak is a critical component of LPC habitat in much of southeastern New Mexico, providing both escape cover and a winter food source (Riley et al. 1992, Giessen 1998). Past widespread application of herbicides such as Tebuthiuron has eliminated shinnery oak over large areas, resulting in extensive loss of habitat. Removal of shinnery oak may destabilize fragile soils in dune areas, negatively affecting both SDL populations and livestock forage production. Shinnery oak does not recover in areas from which it has been completely eradicated. Since almost all shinnery oak reproduction is vegetative (suckering from existing plants), eradication is permanent.

In some locations, however, competition from shinnery oak impedes restoration of grasses and forbs needed for LPC nesting and brood rearing. When this occurs, limited use of chemical treatment can help achieve vegetative standards for quality habitat (see "Definitions and standards," Pathway 1 above). The technical committee of the Working Group has issued the following guidelines for chemical treatment of shinnery oak. Adherence to these guidelines should be emphasized as part of the overall rangeland management strategy for LPC habitat.

- Spraying with herbicides is recommended only when habitat goals cannot be achieved by other means, such as grazing system management.
- Given the condition stated above, treatment of shinnery oak is recommended when necessary to achieve vegetative standards for plant composition and canopy cover—for example, when shinnery oak cover still exceeds guidelines after grazing management has been applied.
- In conducting such treatments, the goal should be to temporarily reduce shinnery oak competition with grasses, allowing grass cover to increase naturally. Herbicides should be used at dosages that will set back (defoliate) shinnery oak, not kill it.
- Large block and linear spraying should be avoided. Instead, application should follow natural patterns on the landscape such that only patches needing treatment are treated.
- Herbicide treatment should never be applied in dune areas and corridors between dune complexes. (See conservation recommendations for the SDL, Chapter 5).
- Herbicide treatment should not be applied around large oak motts, and within 1.5 miles of active lek sites where LPC numbers are large or increasing.
- Post-treatment grazing management is essential to success. Grazing should be deferred for at least two growing seasons after treatment. Grazing after that time may be allowed only if progress towards meeting vegetative standards is being made. Longer periods of rest may be required in some cases, especially during drought conditions.

Conservation Benefits

When carried out on a limited basis as specified in the treatment guidelines above, shinnery oak control may help increase tallgrass cover associated with high quality habitat and LPC nesting success.

Evaluation

Vegetative response in treated areas should be monitored closely relative to guidelines for vegetation. LPC response should be monitored and evaluated by annual counts of birds attending leks on or near affected lands, and by annual brood counts in summer. Although the technical committee predicts that benefits will accrue if control is applied following the guidelines above, there has been no published research demonstrating benefits to LPCs from shinnery oak control. For this reason, careful monitoring of leks and recruitment is essential.

Project Area(s)

This strategy applies only in areas of LPC habitat where dense stands of shinnery oak occur, with the exceptions noted in the treatment guidelines above.

Priority Assessment and Special Considerations

This is not a high priority as a broad-scale strategy, but may be important in some local areas. Care must be taken on the part of management agencies and private landowners in carrying out shinnery oak treatment as a conservation or habitat improvement strategy. Failure to follow treatment guidelines may result in loss of habitat, or decreased habitat quality.

Parties Responsible

Primary responsibility will be with the surface management entity: BLM, NMSLO, or private landowners. Each should seek assistance and technical support from NMDGF and NRCS.

Parties Affected

Private landowners and holders of state or federal grazing leases.

Funding

Projects on private lands may be funded by the property owner. Funding for specific projects on private or state lands may be available through one or more NRCS programs. See Pathway 8 for a description of potential funding sources.

Pathway 2: Minimize habitat loss and modification due to energy development

- Conservation Strategy 2.1: Recommended guidelines for new mineral leasing
- Conservation Strategy 2.2: Minimizing impacts of new and ongoing energy development
- Conservation Strategy 2.3: Coordinating restoration and reclamation of previously developed areas

Pathway overview: Opportunities and challenges

Pathway 1 presented strategies for maintaining or improving LPC habitat on undeveloped rangelands. This pathway addresses development issues that pose a threat to LPCs by reducing the quantity or quality of suitable rangeland habitat in New Mexico. One existing development "footprint" in LPC habitat is from the oil and gas industry, due to its long history and economic importance in southeast New Mexico. For this reason, strategies in this pathway primarily focus on achieving a necessary balance between the needs of industry and the needs of species conservation.

Recommendations presented here are the result of lengthy negotiations, through which all parties came to better understand the various biological, economic, and management constraints pertaining to LPC conservation in areas of active mineral leasing and development. Through this process, key issues were identified and informed compromise proposals were developed by all sides. In the end the group was able to reach consensus around sets of broad recommendations for agency management and industry participation, designed to achieve long-term, productive coexistence between the oil and gas industry and the LPC.

Opportunities and challenges associated with oil and gas development differ across the planning area. The Working Group has taken a regional approach to management issues, with different sets of recommendations pertaining to the Primary Population Area (PPA), the sparse and scattered population areas (SSPA), and the isolated population area (IPA) or "Carlsbad area" (see Map 3 and section 4.2, "Planning regions and management priorities based on population status.") This regional approach is particularly important in conservation strategy 2.1, which presents sets of recommended guidelines for mineral leasing and development for each of the three planning areas. Strategies for minimizing impacts of new and existing development (conservation strategy 2.2), and recommendations for restoring and reclaiming previously disturbed areas (conservation strategy 2.3), may apply more broadly across the range of the LPC.

Over 90 percent of New Mexico's remaining LPC population occurs in the PPA, making it of vital importance to species conservation. Oil and gas activity here is increasing in some locations, but is generally not on a scale comparable to that of the Carlsbad region further south. This central region contains most of the NMDGF Prairie Chicken Areas, and most of the Roswell BLM's LPC Core Management Area. Populations are considered well-distributed and secure, demonstrating that coexistence between LPCs and a moderate level of development is a real possibility. However, a considerable portion of undeveloped habitat in the PPA has been leased for development, and regulatory options are limited once leasing has occurred. Habitat loss is also occurring in the eastern portion of the region due to the conversion of native rangeland to irrigated agricultural fields. The challenges for this region are to secure and build upon the healthy populations already present, ensuring that adequate species protections are established, while providing incentives to industry to participate in conservation and habitat restoration activities and allowing development to proceed outside of important LPC habitat.

Sparse and scattered population areas include LPC range north of the PPA, as well as isolated segments in southeast Chaves County. Maintaining and increasing LPC populations and habitat in this region is considered to be of highest conservation importance. Although the southern segments fall within the BLM Roswell Core Management Area, this region as a whole contains a high percentage of private lands, over which management agencies exercise almost no authority. It also has the least amount of oil and gas development activity of the three management regions. In this setting, conservation must rely heavily on efforts to reach out to, and enlist the support of private landowners. At the same time, policies must be in place to safeguard leks from development disturbance whenever and wherever possible.

Perhaps the greatest development-related challenges exist in the IPA/Carlsbad region, where oil and gas activity is more extensive. In 2003, a single known active lek remained in this area, near Eunice. Recovery of LPC populations in southeastern New Mexico is complicated by the high degree of habitat fragmentation and loss, compounded by several recent years of drought. However, scattered sightings of LPCs are still reported in various locations in IPA, and recent landscape analysis has identified a number of (mostly small) areas that may provide suitable habitat for nesting, brood-rearing, foraging and dispersal. These areas are considered crucial to the future recovery of the LPC in the Carlsbad region, and may be locations for habitat restoration and eventual species reintroduction efforts.

Definitions and standards

Recommendations in this pathway are based on the following understandings.

Areas Defined

(Also see Map 3, "LPC management regions based on population status")

1. The PPA includes the entire region where LPC populations are considered "well-distributed". It includes the portions of New Mexico Townships 6, 7, 8, 9, and 10 that fall between the Texas border and the western edge of Range 30 east. In addition to this large rectangular area, the PPA includes four additional Townships: 9 South 29 East, 6 South 29 East, 5 South 29 East, and 5 South 28 East.
2. To avoid confusion, it should be understood that embedded within the PPA is most of the Roswell Core Management Area (CMA). (The CMA also extends south of Township 10, into a region where LPC populations are considered sparse and scattered.)
3. Sparse and scattered population areas (SSPA) include lands north of New Mexico Township 6 (with the exception noted above), and also lands south of U.S. Highway 380 in southeast Chaves County.
4. Isolated population areas (IPA, "the Carlsbad area") include lands south of New Mexico Township 10 in Lea and Eddy counties, (with the exception noted above.)

Quantifying Development Impacts

As discussed in Chapter 3, recent research has documented behavioral avoidance by nesting LPCs of roads and various forms of infrastructure that may exist in rangeland habitat. R. J. Robel and colleagues calculated mean avoidance distances of nesting LPCs to different anthropogenic features in Kansas (Robel et al. 2004). The Working Group has adopted, with some modifications, these "Robel impact distances" in mapping and calculating the extent of habitat available to LPCs in a given area. Distances used in the calculation of habitat impacts surrounding different development features are as follows:

Oil or gas wellheads	.1 mile	(modified, after Robel et al.)
Sand/dirt 2-track roads, spur roads	0	(group recommendation)
Caliche roads, oil field access roads	.1 mile	(group recommendation)
Paved roads	.5 mile	(after Robel et al.)
Compressor stations	.75 mile	(modified, after Robel et al.)
Houses	.5 mile	(modified, after Robel et al.)
Power lines	.25 mile	(after Robel et al.)
Center-pivot fields	.25 mile	(after Robel et al.)

Habitat Categories

A detailed vegetation map of the PPA has been prepared by the New Mexico Heritage Program and the Earth Data Analysis Center at the University of New Mexico, based on satellite data and ground-truthing. The satellite coverage is very sensitive to differences in vegetative composition and even grass height, and so provides a snapshot of habitat conditions at any given time. The map identifies a number of vegetation types containing shinnery oak that are considered essential habitat for LPCs. The map also includes infrastructure such as active wells and improved roads, and plots LPC avoidance areas around these based on the data provided by Robel et al., as modified by the Working Group.

For planning purposes, a simplified version of the vegetation map has been created that divides all lands in the PPA into one of four categories, as defined below. This map accompanies and should be considered part of the set of guidelines presented here. A small-scale version of the habitat map is included as Map 4.

Occupied habitat. All areas within 1.5 miles of an active LPC lek site, regardless of vegetation (see definition of active lek site, below.) Upon discovery of a previously unknown active lek site, the surrounding 1.5-mile radius circle is considered occupied habitat. This includes approximately 50 percent of the PPA.

Suitable habitat. Unoccupied areas of appropriate vegetation type, in patches of 320 acres or more, falling entirely outside of Robel impact/avoidance distances around infrastructure. This includes approximately 16 percent of the PPA.

Potentially suitable habitat. Unoccupied areas of appropriate vegetation type, but in patches of less than 320 acres and/or falling within Robel impact/avoidance distances around infrastructure. This includes approximately 7 percent of the PPA.

Unsuitable habitat. Areas outside of appropriate vegetation. This may include urban and agricultural areas, areas where shinnery oak is naturally not present or has been eliminated by chemical treatment, and other areas where natural vegetation has been greatly altered or degraded. This includes approximately 27 percent of the PPA.

Definition of an active lek site. A lek is considered active when, with sufficient annual surveys, two or more males have been seen strutting during the mating season at least one year out of the last five.

The four habitat categories were adopted specifically for the mineral leasing guidelines for the PPA in conservation strategy 2.1, but may be usefully applied elsewhere. The specification of a 320 acre minimum patch size for suitable habitat was chosen based on the recommendations of experts within the Working Group. It represents a fragmentation threshold, beyond which lands may be largely unusable as habitat by LPCs. It should not be taken for or confused with an estimation of the area required for the survival of a LPC lek or population.

The most recent peer-reviewed scientific studies should be used to revise any of the definitions or management recommendations in this Pathway.

Conservation Strategy 2.1: Recommended guidelines for new mineral leasing

After lengthy negotiations, in which many different issues and policy options were brought forth and considered, the Working Group has agreed to a set of recommendations regarding the leasing of state and federal minerals in the three planning regions. The intent of these proposed guidelines is to bring about and maintain a productive coexistence between the LPC and the oil and gas industry. For the LPC, this means that adequate protections are provided to prevent further loss of populations or suitable habitat, and that mechanisms for increasing populations and suitable habitat are in place. For industry, the guidelines are structured to minimize any disruption to economic activities in areas not considered essential to LPCs, to encourage habitat reclamation, and to reward successful recovery of LPC populations.

This section departs from the format adopted for the conservation strategies in Pathway One. A numbered series of recommended guidelines will be presented separately for each of the three planning regions. In each case these will be followed by some explanatory text to clarify the thinking and intention of the Working Group in making its proposals. The reader should keep in mind and/or refer to the information presented in the previous section, "Definitions and Standards."

I. Recommendations regarding the Roswell Core Management Area

1. In the Roswell Core Management Area (CMA), the Working Group recommends that existing management policies shall be maintained. There shall continue to be no new leasing in this area, with certain exceptions granted on a limited, case-by-case basis when indicated due to presence of existing infrastructure, or as needed for unitization and drainage purposes, or for parcels a minimum of one mile from suitable habitat.
2. The group recommends that the BLM reevaluate the boundaries of the CMA, expanding or reducing where appropriate based on the habitat analysis.

II. Recommended Guidelines for New Oil and Gas Leasing in the PPA

NOTE: While most of the Working Group agrees that the following set of recommendations for the PPA represents the best proposed strategy at this time, individual companies, conservation organizations, local governments, and individuals reserve the right to submit concerns and objections, and to make suggestions on their own to strengthen the plan or address particular development or conservation concerns.

1. All recommended guidelines in this section apply to lands within PPA *outside of and excluding* the CMA, which is treated above. However, as an exception to this general provision, it is recommended that the separate, easternmost rectangular section of the CMA be managed under the guidelines here proposed here for the PPA. This

recommendation applies only to the oil and gas guidelines and does not otherwise affect the boundaries or management of the CMA.

Leasing recommendations for habitat categories in the PPA

2. The group recommends that areas designated as **unsuitable habitat** be open for new leasing, with no new or additional restrictions, unless such habitat occurs inside a state Prairie Chicken Area (PCA) or is affected as described in item 4 below.

3. The group recommends that *most but not all* areas designated as **potentially suitable habitat** be open for new leasing. BLM may choose to defer leasing, or lease with stipulations, in some areas which, by virtue of their size, location with respect to other habitat, and existing conditions, are considered priority areas for habitat restoration. These will generally be areas where development impact is minimal and transformation to suitable habitat is feasible, particularly where such improvement can help "block up" larger surrounding areas of suitable habitat.

4. Additionally, in keeping with the definitions and item 5 below, leasing may be deferred or stipulated in certain instances where development in **unsuitable** or **potentially suitable habitat** would extend an impact/avoidance zone into **suitable habitat**. Such exceptions to the general rule for unsuitable and potentially suitable habitat will be identified and discussed in the ongoing management conversation between the BLM and industry.

5. In areas designated as **suitable habitat** or as **occupied habitat**, the group recommends deferring new leasing with surface occupancy of federal minerals, or leasing with stipulations, pending achievement of the appropriate criterion specified in 8 or 9 below, or leasing with stipulations that would achieve the same criteria. Certain exceptions may be granted on a limited, case-by-case basis when indicated due to presence of existing infrastructure, or as needed for unitization and drainage purposes. Note—Industry has strong reservations that this rule may not achieve intended benefits.

6. The group recommends that the SLO continue current management practices of new lease deferral in occupied habitat.

7. In state **Prairie-Chicken Areas** (PCAs), the group recommends no new leasing of Federal minerals with surface occupancy. Leasing with a No Surface Occupancy stipulation may be allowed, where this is determined to be appropriate. Note that guidelines for lifting lease deferment below do not apply to the PCAs. The group also recommends that the NMDGF seek to acquire mineral rights for the PCAs—see Conservation Strategy 3.3.

Criteria for lifting of lease deferment in suitable and occupied habitat in the PPA

8. The group recommends that new leasing in **suitable** habitat would again be allowed if, by annual re-calculation, there is demonstrated a net increase in the sum of suitable and occupied habitat in the PPA. Lease deferment would be lifted for an area equal to the area of increase. (See further details under "Monitoring and administration," below.)

9. The group recommends that new leasing in **occupied** habitat would be again allowed if the above criterion for suitable habitat is met, AND there is a statistically significant LPC population increase statewide over the previous five years. (See further details under "Monitoring and administration," below.)

10. In 8 and 9 above, it is understood that across the PPA, the sum of suitable and occupied habitat area may increase or decrease for a variety of reasons, including habitat reclamation efforts, changes in rangeland management, changing climatic conditions, lek establishment outside of suitable habitat, new mineral development, and agricultural conversion of rangeland. Thus the general equation for calculating changes in suitable habitat (factoring in Robel impact areas in both gains and losses) is:

$$\begin{aligned} &\text{Suitable habitat acres gained (by reclamation, range improvement, etc.)} \\ &- \text{Suitable habitat acres lost (due to agriculture, new development, range declines, etc.)} \\ &= \text{Net change in suitable habitat} \end{aligned}$$

Note that lifting of lease deferment is not contingent upon the reason for an increase, only that an overall net increase has occurred. On the other hand, reclamation projects alone are not automatically rewarded by a lifting of lease deferment, if conditions overall are declining. The logic of this arrangement is to ensure that a bottom-line standard of habitat protection is maintained, while rewarding overall success in improving conditions for LPCs.

11. The above guidelines pertain only to new leasing. The right of industry to develop existing leases is recognized and affirmed. It is understood that Negotiated Plans of Development (PODs) and Conditions of Approval may be employed to guide orderly development on any new federal leases in potential, suitable, or occupied habitat, and on existing federal leases in such habitat. BLM should also explore options for imposing more stringent management on existing leases, in cases of need. (See Conservation Strategy 2.2, "Minimizing impacts of new and ongoing development" for further recommendations regarding existing leases and ongoing development.)

Monitoring and administration

It is recognized that the proposed guidelines can only function as intended if there is a mechanism for accurate and up-to-date accounting of changes in surface conditions and LPC populations in the PPA. To achieve habitat accounting, two complementary and overlapping mechanisms are proposed: periodic updates of the PPA habitat map, and ongoing tracking and accounting of habitat reclamation/restoration efforts.

12. **Updating the PPA habitat map.** Before the guidelines go into effect, the baseline map must be completed in a manner satisfactory to all parties. Once the baseline map is established and agreed to, area totals for the four land categories will change only as a result of changing habitat conditions (and not simply as a result of further refinements to the map or the data used to generate it.)

Satellite reflectance data for vegetation are available any time. For the purpose of tracking changes in surface conditions in the PPA, a new map update should be completed annually. Updates at different intervals may occur upon agreement of the parties and availability of funding. Map updates should be coordinated through and funded by the agencies.

In addition to changes in vegetation, map updates will incorporate all known changes in roads and infrastructure during the time interval. Associated impact/avoidance areas (see Definitions and Standards, above) will be plotted or deleted as needed.

13. Tracking and crediting habitat reclamation. It is important that all improvements in LPC habitat be captured in the periodic map updates and the recalculation of land area falling into the four categories. As a supplement and cross-check to the satellite mapping, there shall be an information clearing house for reporting and tracking of reclamation/restoration projects, as well as new development or other habitat losses, with oversight by both agency and industry representatives. Information maintained by this clearing-house, or by other ground-truthing, can be used to refine or override the satellite mapping.

If an area formerly classified as unsuitable or potentially suitable is reclassified as suitable, according to an updated satellite analysis, it will automatically be counted as such in the new area calculation. However, as noted above, an area where reclamation is under way may also be reclassified as suitable if criteria stated below are met—regardless of the satellite analysis.

The criteria below, for counting reclaimed areas as suitable habitat, do not describe the final goal of reclamation or habitat improvement projects generally, which is to create quality habitat for LPC nesting and brood-rearing (see Definitions and Standards, Pathway One). Rather, for the purpose of the area calculation, the criteria are intended to allow credit for reclamation work that has been carried out and that shows initial signs of success, prior to the full development of vegetative cover. This is a compromise between the divergent positions that credit for reclamation should come either immediately upon completion of the work, or not until vegetative standards have been met.

For the purpose of the area calculation described in point 8 above, a previously developed area may be reclassified as suitable habitat:

- If roads have been closed or removed and structures have been removed, according to applicable agency standards and guidelines, such that the area is no longer affected by any Robel impact/avoidance zone; and
- If appropriate vegetative structure is not already present, initial reclamation has been conducted to appropriate BLM standards.

Further specification of recommended practices for reclamation of developed areas is provided in Conservation Strategy 2.3.

Rangeland management strategies described in Pathway One (such as mesquite removal) may also result in the establishment of new areas of suitable habitat. Since these involve direct changes to the structure and composition of vegetation, the results should be immediately apparent in the satellite analysis.

14. Tracking occupied habitat. Management of mineral leasing according to the guidelines proposed here requires that there be complete data sharing among all parties, such that all known lek sites are accounted for on the baseline map. At the same time, appropriate care must be taken not to make precise locations on private land publicly available, without landowner consent.

Occupied habitat may increase or decrease with the discovery or disappearance of active leks (see “Definitions and standards,” above) in the PPA, regardless of vegetation. In some areas, increased survey effort may reveal existing lek locations that are not currently known. Note that since federal leasing is deferred in both suitable and occupied, the discovery of new leks in suitable habitat areas would not affect the overall calculation of habitat.

15. Tracking population trends. As stated in 7 above, new leasing in occupied habitat is contingent upon a positive, statistically significant population trend for LPCs statewide over the previous five years. Advice from a consulting statistician is being sought in order to determine the level of sampling needed to achieve significance, and to help decide what percent increase is a reasonable standard.

16. The final calculation of area added to or subtracted from each of the four land categories will take place after the map update and all subsequent adjustments have been completed and agreed to. If there has been an increase in the sum of suitable and occupied habitat, lease deferment can be lifted in an area of suitable habitat in the PPA equal to the area of increase. Locations where deferment is to be lifted will be determined by a mixed advisory panel and/or through industry-agency negotiation. Industry will have the opportunity to request that specific areas be opened to leasing.

III. Recommended Guidelines for New Oil and Gas Leasing in the Sparse and Scattered Population Areas (SSPA)

1. In occupied habitat in the SSPA, the group recommends that the SLO maintain its policy of deferring new leasing with surface occupancy of state minerals.
2. In occupied habitat in the SSPA the group recommends deferring new leasing with surface occupancy of federal minerals. Federal leasing with a No Surface Occupancy (NSO) stipulation may be allowed, where this is determined to be appropriate.
3. The above deferments would remain in place pending realization of criteria to be determined. Future leasing in occupied habitat would be linked to the status of the species

and/or habitat in New Mexico, as identified in the annual FWS candidate notice of review and/or other periodic agency review.

4. It is also recommended in Conservation Strategy 3.2 that two new areas or combinations of areas that can function as LPC reserves be established in the northern SSPA. These should be located within predominantly suitable habitat areas that are large enough to support viable LPC populations and meet other criteria specified in Conservation Strategy 3.2. Once established, further leasing with surface occupancy would be deferred in reserve areas.

5. The right of industry to develop existing leases is recognized and affirmed. It is understood that Negotiated Plans of Development (PODs) and Conditions of Approval may be employed to guide orderly development on any new federal leases in potential, suitable, or occupied habitat, and on existing federal leases in such habitat. (See Conservation Strategy 2.2, "Minimizing impacts of new and ongoing development" for further recommendations regarding existing leases and ongoing development.)

6. It is important that agencies work together and that all affected parties be kept fully informed regarding lek status and locations (while respecting confidentiality concerns of private parties), and regarding when and where lease deferments due to occupied habitat will be implemented. Agencies should strive to keep all land owners and users informed regarding LPC conservation needs and measures generally, and work with industry to help encourage and carry out practices for minimizing development impacts in occupied or other sensitive habitat areas. See also Conservation Strategy 2.2 below.

IV. Recommended Guidelines for New Oil and Gas Leasing in the Isolated Population Area (IPA) / "Carlsbad Area"

1. In occupied habitat in the IPA /Carlsbad area the group recommends deferring new leasing with surface occupancy of federal minerals. Federal leasing with a No Surface Occupancy (NSO) stipulation may be allowed, where this is determined to be appropriate. (Note this recommendation would currently apply only to a single known active lek.)

2. The group recommends that further habitat suitability analysis be conducted in the IPA, focusing on the 17 areas previously identified by the Carlsbad Field Office as having habitat that may be of value to LPC recovery, and on areas where LPCs have recently been sighted. This analysis should be completed by January 1, 2007, or sooner. Agencies and industry should work together to expedite the habitat analysis, and to ensure that sufficient manpower and resources are available to meet the target deadline.

Focus areas should be prioritized for reclamation potential, and for potential to maintain re-established LPC populations over time. An advisory committee of stakeholder representatives should be formed to work with and offer input to BLM regarding prioritization of areas, and subsequent management recommendations. Areas determined

to be lacking high conservation value should be eliminated from further consideration for special management.

BLM should pursue a range of options to maintain habitat value in areas determined to be of high conservation importance. These options include guided development on existing leases through the use of PODs and voluntary agreements (as described in Conservation Strategy 2.2,) lease stipulations, deferral of new leasing in areas determined to have value for LPC recovery, and other strategies. Management approaches will be determined and pursued as appropriate, on a case-by-case basis. Note that some areas that may be important to LPC recovery may already be receiving management protection under guidelines adopted for the Sand Dune Lizard. Strategies for population recovery in the Carlsbad area are further elaborated in Conservation Strategy 4.1, "Identify, manage and restore potential habitat areas in southeast New Mexico."

3. Any lease deferments as described above would remain in place pending realization of criteria to be determined. Future leasing in occupied or other protected habitat would be linked to the status of the species and/or habitat, as identified in the annual FWS candidate notice of review and other periodic review.

4. Additionally, it is recommended in Conservation Strategy 3.2 that two new areas or combinations of areas that can function as LPC reserves and sites for LPC reintroduction be established in the IPA/Carlsbad area. These should be located within predominantly suitable habitat areas large enough to support viable LPC populations and meet other criteria specified in Conservation Strategy 3.2. It is recommended that the WIPP site serve as the location of one such reserve (see Conservation Strategy 4.2). Potash enclaves and private lands that may be available from willing sellers should be considered as a second possible reserve location. Once established, further leasing with surface occupancy would be deferred in reserve areas.

5. The right of industry to develop existing leases is recognized and affirmed. It is understood that Negotiated Plans of Development (PODs) and Conditions of Approval may be employed to guide orderly development on any federal leases in potential, suitable, or occupied habitat. See also Conservation Strategy 2.2, "Minimizing impacts of new and ongoing development" for further recommendations regarding existing leases and ongoing development.

6. It is important that agencies work together and that all affected parties be kept fully informed regarding lek status and locations (while respecting confidentiality concerns of private parties), and regarding when and where lease deferments will be implemented. Agencies should strive to keep all land owners and users informed regarding LPC conservation needs and measures generally, and work with industry to help encourage and carry out practices for minimizing development impacts in occupied or other sensitive habitat areas. See also Conservation Strategy 2.2 below.

Conservation Strategy 2.2: Minimizing impacts of new and ongoing energy development

Under the guidelines presented above in Conservation Strategy 2.1, new mineral leasing and development will continue in most areas outside of suitable and occupied habitat in the PPA, and outside of occupied habitat and reserve areas in the SSPA and the IPA. In all three regions, new development may continue in suitable and occupied habitat areas for which state or federal mineral leases have already been obtained. Where and how this new development proceeds may affect both future leasing opportunities and the future status of the LPC in New Mexico. The Working Group recognizes that, once a valid mineral lease has been purchased, development of that lease cannot be precluded by regulatory means. However, development impacts can be greatly minimized through the establishment of negotiated guidelines and variety of mitigation strategies.

Management of existing leases

In all three planning regions, the group acknowledges that the BLM may employ negotiated Conditions of Approval (COAs) and Plans of Development (PODs) for existing federal mineral leases, to help ensure orderly development with a minimum of surface impact in LPC habitat. The group recommends that these requirements should not be used to prevent development from moving forward at a reasonable pace. BLM should also explore options for imposing more stringent management on existing leases, in cases of need.

Included in COAs and PODs may be specification of various strategies for minimizing impacts associated with new development, and for reclaiming developed areas, as discussed more generally below.

In all three planning regions timing and noise stipulations, such as are currently in place on federal mineral leases in LPC areas, should be maintained only as needed. These stipulations are intended to prevent disruption of LPC leking and nesting by activities associated with energy exploration and development. Stipulations should be imposed only in areas where LPCs are present, as indicated by sightings or survey reports within a period of 2 years. Exceptions may be granted on a case by case basis. In areas where adequate surveys over two years have not detected LPCs, stipulations should be waived. They should be re-applied if LPCs reappear.

Mitigating development impacts

In areas that have already been leased, including suitable and occupied habitat, development may proceed at the discretion of the lease holder, in consultation with BLM. In sensitive habitat areas or where existing LPC populations may be affected, the group recommends that lease holders consider various "least impact" options, including choosing to forego development until a later date and/or use of directional drilling to avoid surface disturbance. Suitable habitat so maintained will be reflected in the area calculation that determines when additional areas may be opened to leasing, as described in Conservation Strategy 2.1. It is acknowledged, however, that these options may not be preferred by industry and that new development in suitable and occupied habitat will sometimes occur.

Throughout the planning region, on both private and public lands, voluntary efforts are encouraged to limit new surface disturbance impacts in suitable and occupied habitat. This is particularly true in the northern portion of the SSPA, where most LPC habitat is on private land. Agencies should strive to keep oil and gas operators aware of LPC conservation issues and of the need for, and benefits of, such voluntary efforts. This should include provision of educational materials. Operators should be given guidance in how best to plan and carry out projects in a way that would minimize impacts on LPC populations and habitat.

A variety of techniques may be applied to reduce or mitigate impacts of oil and gas activities in active production areas, and to reclaim sites or facilities no longer in use. Targeted use of mitigation and reclamation techniques may yield significant benefits in areas where development is at a relatively low level, and where suitable or occupied habitat can be maintained by the strategic placement, co-location or consolidation of roads, structures, power lines, and other features or equipment. While infrastructure itself may not occupy a large amount of surface area, the suitable habitat that may be gained by infrastructure removal includes surrounding impact/avoidance zones (see Definitions and Standards, above). Thus there is a high rate of return, in habitat acres, for infrastructure removed or consolidated.

A number of specific actions may be taken to reduce fragmentation and development impacts in LPC habitat. Even in areas where economic activity is continuing, abandoned or unneeded roads, power lines, well pads, and other structures may be removed, and their sites reclaimed. In some locations, multiple roads serving separate drill sites operated by different companies may be replaced by a single, shared access road to a project area. The Working Group recommends that agency road policies be modified, such that exploration roads may be built to standards that result in less surface impact than roads built to standards for operations. (As noted in "Definitions and Standards," an impact/avoidance distance of .1 mile on either side is calculated for caliche roads, while no impact/avoidance area is calculated around sand/dirt two-track roads.)

Individual well plugging at the time of economic depletion should be encouraged, with site and access road reclamation to follow shortly thereafter. Companies should be encouraged to remove all structures from the site. If power poles are owned by a third party, industry should work with the owner to have them removed in a timely manner. Reclamation of production sites may involve caliche removal, disking and fertilization, and reclaiming with native species. The Working Group recommends that current BLM and New Mexico Oil Conservation Division (NMOCD) protocols and seed mixes for site reclamation should be evaluated and adjusted to better provide for the needs of the LPC. Reclamation should be carried out to establish an appropriate mixture of native grasses, forbs and shrubs, with a long-term goal of meeting vegetative standards. The following section, Conservation Strategy 2.3, also deals with reclamation and restoration, focusing on previously developed areas now out of production.

Conservation Strategy 2.3: Coordinating restoration and reclamation of previously developed areas

Long-term planning for increasing and/or restoring LPC populations in New Mexico should recognize the temporary nature of current development activities. Although mineral extraction

may occur on a given piece of land over a period of many years, eventually resources become exhausted and wells and related infrastructure are taken out of production. In some areas this has already occurred; elsewhere, some wells are nearing maturity and may be retired soon or within the next decade. This will create opportunities to increase suitable habitat, and to create or expand LPC management areas

In portions of the LPC's range in New Mexico, abandoned production sites with plugged wells remain from a previous era of development. These sites, which were never reclaimed to today's standards, provide an opportunity for broad-scale restoration that can increase the extent of suitable habitat. The BLM is currently proposing a broad-scale reclamation project for these "legacy" sites in LPC habitat in Eddy, Lea, Chaves, and Roosevelt counties. Pilot projects in the past year have focused on reclamation of abandoned well-pads and access roads, and re-contouring these sites with the surrounding landscape. The Working Group supports these efforts and recommends BLM, NMOCD, industry, and ranch operators continue to work together in planning and carrying out this large reclamation effort.

As part of a comprehensive recovery strategy it is important to address foreseeable changes in land uses over the long-term. Advance planning and site prioritization are needed in order to take full advantage of opportunities to increase and improve LPC habitat in New Mexico over a time frame extending beyond the next few years. These should be informed by the habitat suitability analysis and mapping described in "Landscape Analysis" earlier in this chapter and by other parallel efforts. The goal is a forward-looking approach by which retired and reclaimed oil field areas are gradually brought into an expanding network of lands managed for LPC habitat protection.

Reclamation of abandoned and out-of-production sites is a long-term strategy, directed towards managing the eventual transition from mineral extraction back to other land uses in a manner consistent with LPC and SDL conservation objectives. However, it must be pursued on an incremental basis, starting with site-specific mitigation strategies described in Conservation Strategy 2.2 and extending to larger areas. All such work should be closely monitored and credited, as described in Conservation Strategy 2.1. Special consideration is given to the IPA/Carlsbad area in Conservation Strategy 4.1. In this region, coordinated reclamation of retired oil fields may be extremely important over the long term as a means of reversing landscape fragmentation and facilitating the restoration of viable LPC populations to southeastern New Mexico.

An important consideration is that while eventual retirement of all active wells is a certainty, it is impossible to know precisely when production will end for a particular development or region. Retirement of certain areas from production may be affected by a number of factors, including current well productivity, economic considerations (such as the price of oil), and potential conservation benefits to be achieved. In addition, new technologies may in the future allow extraction of resources that cannot be reached or economically harvested by existing equipment, potentially prolonging the life of a production site.

Restoration and reclamation projects are generally carried out by the oil and gas industry, with guidance from, or according to standards set by, BLM on federal lands, NMOCD and NMSLO

on state lands, and possibly NRCS on private lands. Project evaluation should include accounting of projects undertaken and completed, vegetation monitoring relative to standards, and annual monitoring of leks on or near affected lands. Broad-scale reclamation may be the most publicly visible component of industry efforts to contribute to LPC conservation, and may have added significance for that reason.

Pathway 3: Consolidate and expand network of reserves and other areas managed for LPC conservation

- Conservation strategy 3.1: Land and mineral exchanges to consolidate federal holdings in BLM core management areas
- Conservation strategy 3.2: Options for acquiring or designating lands for LPC reserves
- Conservation strategy 3.3: Develop and implement a comprehensive management plan for the PCAs
- Conservation Strategy 3.4: Develop Candidate Conservation Agreements with Assurances (CCAAs) to promote conservation efforts on state and private lands

Pathway overview: Opportunities and challenges

Along with on-the-ground efforts to improve the quality of rangeland habitat (Pathway 1) and minimize development impacts (Pathway 2), there must be an effort to establish an adequate network of reserves and other lands managed for LPC conservation on a broad scale. Conservation of the species requires that some large blocks of native rangeland be protected and managed largely or exclusively as LPC habitat. These may occur in designated reserves or in other kinds of special management areas, or on large tracts of private land. Such protected areas should not be limited to regions where healthy LPC populations currently exist. Establishing reserve sites in the isolated and sparse-and-scattered population areas is particularly important, to prevent further fragmentation and to help maintain or re-establish habitat capable of supporting viable LPC populations in these regions. In addition to large reserves, it is also important that there be smaller blocks of land managed as LPC habitat distributed across the planning region. Protected areas of all kinds should form a broad network, linked wherever possible by habitat corridors to maintain or re-establish connectivity between populations.

The nucleus of such a network already exists, consisting of designated BLM core management areas, the PCA system maintained by NMDGF, and a few private holdings on which significant habitat restoration is taking place (see Map 3). While declines have occurred elsewhere, LPC populations have remained healthy in most of these protected areas. The Working Group has discussed various strategies for adding to and consolidating this network, in a manner that respects the rights and economic interests of property owners. Significant gains can be achieved through interagency land exchanges resulting in the consolidation of BLM holdings within that agency's LPC core management area. Such a strategy can protect essential habitat for species conservation while easing restrictions on energy development in other areas. Additional opportunities exist to establish new LPC reserve areas in key locations through designation of

federal lands, or by the acquisition of lands from willing sellers, or through the purchase of conservation easements. The potential to bring more state and private lands into some form of conservation management can be greatly increased by the development of a regional Candidate Conservation Agreement with Assurances (CCAA) between the FWS, state agencies, and private parties. It should be noted that the establishment of effective reserves or other protected areas should entail the subsurface mineral estate along with the surface area.

These strategies clearly go hand in hand with elements of the other conservation pathways. Efforts to improve local habitat quality and expand suitable habitat areas can help bring about and maintain conditions desired for special management areas, and form part of a broad network of lands managed with a commitment to LPC conservation.

Conservation Strategy 3.1: Land and mineral exchanges to consolidate federal holdings in BLM core management areas

Description

Efforts to manage large areas of land as LPC habitat are complicated by existing patterns of land ownership and management authority, and sometimes by conflicting agency policies and mandates. For example, BLM restrictions on mineral leasing in a designated area may not yield optimal conservation benefits if high levels of energy development occur on state lands nearby. Currently the Roswell BLM Field Office maintains a large LPC Core Management Area (CMA) composed of several discreet land segments, where no oil and gas leases have been issued since 1997. Areas to be included in Roswell CMA are currently under agency review. (See Working Group recommendation for changing boundaries of the Roswell CMA associated with recommended guidelines for mineral leasing, Conservation Strategy 2.1).

The Working Group recommends a coordinated pursuit of land exchanges between the BLM and the SLO in the Roswell Field Office, in order to expand the size and connectivity of the BLM-administered CMA that would be withheld from surface-disturbing activities. The strategy may provide benefits to the SDL, as well as the LPC. The BLM would acquire state lands and/or mineral rights within important areas of habitat for inclusion in its CMA. The SLO would acquire surface or mineral rights on federal lands considered less important for LPC or SDL conservation, and offer these for oil and gas leasing. The simplest transactions would involve state lands where minerals are currently unleased, but exchanges involving a third-party lessee are also possible. In such cases the buying back of leases from willing sellers may sometimes be required. Properties considered for exchange under this strategy should be located within the same county; those located within the same ranch operation are ideal, though such opportunities may be rare.

Critical to the success of this effort is a commitment on the part of both agencies to identify and actively pursue mutually beneficial exchanges that will yield conservation benefits. These efforts can be facilitated by support from the oil and gas industry. A successful land exchange effort will not only have to address minerals, but also have to take grazing leases into account and ensure no net economic losses to ranchers.

Conservation Benefits

This effort will help ensure that large blocks of contiguous habitat are maintained and managed for LPC and SDL conservation. Further fragmentation of habitat will be prevented. Important protection will be provided for areas that have not yet experienced significant impacts from energy development, but that may be subject to such impacts in the future. This strategy will help secure habitat both in areas where LPC populations are healthy and in areas where they are sparse and scattered. Land and mineral exchange is considered an optimal means of securing protected areas free of the complications that arise from a split surface - mineral estate.

Evaluation

Agencies should submit an annual program report to stakeholders describing progress in LPC habitat protection through federal-state land and mineral exchange.

Project Area(s)

This strategy applies to BLM and SLO-administered lands in the Roswell Field Office, including areas of east Chaves and southwest Roosevelt counties where LPC populations are considered healthy, and areas in southeast Chaves County (south of NM Highway 380) where LPC populations are considered sparse and scattered. Of highest priority is the acquisition of lands in the southern portion of the CMA where sparse and scattered populations currently exist. Several unleased tracts of state land in east and southeast Chaves County have been identified as possibilities for initial exchange negotiations.

Priority Assessment and Special Considerations

Highest priority. The Working Group considers land exchange to be an important strategy for protecting occupied LPC habitat from fragmentation and development, one which does not require a significant new source of funding. The strategy is supported in principle by all stakeholders and is seen as mutually beneficial from conservation and industry perspectives.

Parties responsible

BLM and NMSLO.

Parties affected

Private parties or companies holding or interested in acquiring federal or state mineral leases on lands considered for exchange. Holders of state or federal grazing permits may be affected by an exchange of surface ownership.

Funding

BLM and NMSLO will require additional budgetary and staff allocations to establish a land exchange program. Agencies may need to provide funding to buy back leases from willing sellers, if this is considered a viable option.

Conservation Strategy 3.2: Options for acquiring or designating lands for LPC reserves

Description

Where land exchanges are not possible, an alternative strategy is to secure and establish reserve areas, to be managed with a long-term commitment to maintaining quality LPC habitat. This effort closely parallels the previously described strategy of land exchange in its general purpose and objectives. Preventing further fragmentation of habitat and establishing new and expanded management areas for LPC conservation are considered top priorities for protecting the species.

Currently, lands within the PCA reserve network administered by NMDGF receive the greatest degree of habitat protection and management attention on the needs of LPCs, but most of the PCAs are fairly small. The Working Group believes that several larger but similarly protected reserves are needed in key areas. These need not necessarily be administered as PCAs or follow the PCA model. For example, in some areas it may be desirable to allow limited grazing, following guidelines and strategies described in Pathway 1. New reserves may be established through the purchase of private lands from willing sellers. Reserve status may also be established on private lands through the purchase of conservation easements or through long-term leases. Reserves on public lands may be managed as NMDGF Prairie Chicken Areas, as federal dedications such as BLM Special Management Areas or as commitments of other federal, state, or local governments. The key element is that necessary restrictions on use be upheld through a long-term commitment to maintaining quality LPC habitat.

Accordingly, the Working Group has made the following recommendations.

A **LPC reserve** is defined as an area of primarily sand shinnery or sand sage-grassland habitat in which activities detrimental to LPCs are *not allowed*, and where the land is managed specifically to optimize LPC habitat. Grazing, if any, must be very conservative. Petroleum development must be absent. Roads must be minimized. Controlled access for wildlife viewing may be acceptable. LPC reserves may be located on public or private lands.

LPC reserves should consist of *at least* 4 square miles (2560 acres) of contiguous habitat that is predominately shrub/grassland on sandy soils. It is desirable that the surrounding 12 square miles (7680 acres) be managed with major considerations for LPC habitat, through the various strategies described in Pathways 1 and 2.

A minimum of five new LPC reserves should be established within the next few years. New reserves are most needed where populations are already isolated or sparse and scattered. Accordingly, at least two LPC reserves should be established in the Isolated Population Area in Lea or Eddy counties; these will provide necessary habitat for proposed reintroductions in southeastern New Mexico. At least one LPC reserve should be established where populations are sparse and scattered in southeast Chaves County, south of Highway 380. At least two new LPC reserves should also be established where populations are sparse and scattered in north Roosevelt, Curry, and east De Baca counties.

Pursuit of this strategy will require ongoing interagency coordination in order to identify and prioritize potential reserve areas and protection mechanisms. Significant funding will also be needed, and this will likely require multiple sources. Conservation organizations have expressed

a willingness to participate in funding for new reserves. Work will be required to generate support and address the concerns of neighboring landowners and ranch operators.

This effort can and should also be pursued on a more opportunistic basis, as properties with high LPC habitat value come up for sale. In this regard, partnerships with private conservation organizations such as The Nature Conservancy may be important to carry out the acquisition of lands pending their eventual transfer to agency administration or ownership. An important consideration regarding final ownership of reserve areas purchased from private parties may be county requirements that specify no net loss of privately held lands.

Conservation Benefits

As with land exchanges, this effort can help block up and protect areas of important LPC habitat in important areas, protect isolated populations, and establish safe corridors for LPC dispersal and interchange among population units.

Project Area(s)

Several general areas have been identified as being highest priority for the establishment of new reserves—see recommendations above. Outside of these areas, any available lands containing important LPC habitat within historical range of the species in New Mexico may be considered for acquisition and management as protected areas.

Priority Assessment and Special Considerations

High priority. All efforts to enhance or increase habitat connectivity, and increase the total area in which priority is given to LPC management and conservation, are considered important steps to species protection in New Mexico. This effort should be coordinated with other strategies (land exchange, PCA management, CCAA protections on private lands) for placing important habitat areas under protective management. It is important to consider mineral issues when establishing LPC reserves—the acquisition of a surface area cannot guarantee protection if mineral rights remain under separate ownership.

Parties responsible

Potential involvement by BLM, NRCS, NMDGF, and private conservation organizations.

Parties affected

Private parties may be affected by participating in the sale of property or easements, or by the establishment of LPC reserve areas on neighboring properties.

Funding

Initial funding for some acquisitions may be provided by private conservation organizations. However, significant additional funding will likely be required. Possible sources include increased NMDGF budgetary allocations. See Pathway 8 for more information on funding mechanisms.

Conservation Strategy 3.3: Develop and implement a comprehensive management plan for the PCAs

Description

The PCA network maintained by NMDGF includes 29 relatively small areas managed primarily for LPCs, totaling roughly 24,000 acres. In a number of these areas, LPC populations have remained healthy and even shown increases in recent years. Along with other efforts to expand the network of protected areas, the PCA system may benefit from a comprehensive effort to improve and coordinate management to best maintain high quality LPC habitat.

A new management plan for the PCAs would emphasize a number of elements. Management priorities that might be articulated in a new PCA plan include:

- Addressing potential complications to long-term management stemming from federal and SLO ownership of mineral rights on PCAs. An exchange strategy such as described in Conservation Strategy 3.1 may be necessary to consolidate PCA estates.
- Greater focus on management of vegetation to achieve standards for nesting and brood-rearing habitat.
- Consideration of possible use of grass banks.
- Increased research on PCAs to improve knowledge of basic LPC biology and to test, on a limited basis, responses to different management techniques including limited grazing.
- Establishment of more precise management goals for the entire PCA system.
- Evaluation of PCA network effectiveness in meeting landscape-level needs of the LPC, including examination of possible network reconfiguration or consolidation.
- Acceleration of projects to survey and fence PCA units.
- Increased use of PCAs as a vehicle for public education and demonstration.
- Increased efforts to gain local landowner support for PCA objectives, and to work with landowners to extend habitat benefits beyond PCA boundaries.
- Increased funding for PCA staff, including a full-time PCA manager.

Conservation Benefits

PCAs are the only LPC reserves in New Mexico, and as such are vital to conservation efforts. This effort will help ensure their full potential and value is realized. Habitat quality on the reserves will be maintained or improved to benefit local LPC populations. Coordinated planning across individual units will help advance efforts to manage on a landscape scale and connect isolated populations. Research and outreach efforts will lead to improved LPC management on PCAs and in other areas.

Project Area(s)

Primarily east-central New Mexico. This strategy applies to all existing PCAs (see Map 2) and to any new PCAs that may be established.

Priority Assessment and Special Considerations

High priority. Making best use of the PCA reserve system is an important and logical starting point for protecting LPC populations in east-central New Mexico. It is important that PCAs not be over-utilized for research and demonstration projects, to a degree that may interfere

with their primary function of protecting LPCs. Such projects should be prioritized and applied with caution.

Parties responsible

NMDGF is responsible for the PCAs.

Parties affected

Potentially, neighboring landowners.

Funding

State program funds made available to NMDGF for PCA management.

Conservation Strategy 3.4: Develop Candidate Conservation Agreements with Assurances (CCAAs) to promote conservation efforts on state and private lands

Description

Candidate Conservation Agreements with Assurances (CCAAs) are formal agreements under the Endangered Species Act between the FWS and non-federal parties wishing to carry out conservation actions on behalf of candidate species, such as the LPC and the SDL. This program provides non-federal property owners with assurances that voluntary conservation efforts undertaken on behalf of a candidate species will not result in future regulatory obligations, should listing occur, beyond those agreed to in the CCAA. Thus, from a private landowner perspective, conservation practices can be safely carried out without fear of additional regulatory burdens or land use restrictions at some later date. The impacts of listing are known in advance. These rights and assurances are transferable upon sale of the land, if the new owner agrees to become part of the CCAA.

Participants in a CCAA voluntarily commit to implementing specific management actions that the FWS determines will significantly contribute to eliminating the need to list the target species. These may include actions taken by property owners to protect existing populations or habitat areas, reduce habitat fragmentation, restore degraded habitat, create new habitat, augment existing populations, or restore historic populations. A CCAA may also include allowing access for species surveys. Thus, many of the actions and strategies described in this chapter might be included for coverage under a CCAA. The FWS provides technical assistance in the development of these agreements, and evaluates the effectiveness of proposed actions with regard to species conservation needs.

No single property owner's action may eliminate the need to list, but CCAAs may encompass and take into account the actions of many parties over a wide area. An existing CCAA for another prairie grouse species, the Columbia Sharp-tailed Grouse, offers a useful example of this kind of effort. Negotiated between the FWS and the Oregon Department of Fish and Wildlife, it covers a large geographic area and involves numerous private landowners.

CCAAs apply only to non-federal lands, and so cannot alone provide satisfactory assurances to parties whose land uses include both private and federally leased lands. However, parallel protections from listing-related encumbrances on the use of federally leased lands may be negotiated between the FWS and the BLM. Should listing occur at some time in the future, landowners not already participating in a CCAA may still engage in a Safe Harbor Agreement with the FWS. Like a CCAA, but applying only to listed species, a Safe Harbor Agreement provides assurances against additional restrictions should a listed species colonize a landowner's property or increase in numbers as a result of habitat enhancement or other conservation management.

The Working Group strongly recommends that a CCAA be negotiated with both the NMSLO and the NMDGF in all or portions of Eddy, Lea, Chaves, De Baca, Curry, Roosevelt, and Quay counties. Private landowners in the area, many of whom carry out grazing and/or mineral development on both private and leased land, could be included in this agreement by a Certification of Inclusion. Individual CCAAs between a landowner and the FWS are also possible. Because of the checkerboard nature of land ownership in the region, participation would increase if the CCAA were developed in tandem with a similar conservation agreement with the BLM.

Conservation Benefits

As an instrument for encouraging voluntary conservation efforts, a broad-scale CCAA would help achieve the benefits associated with many of the conservation strategies outlined in this document. Benefits achieved by state agencies—such as those accruing from NMDGF management of state Prairie-Chicken Areas—and by private conservation efforts would be formally recognized. With landowner participation, increased survey access on private lands would help in overall planning and management efforts for the LPC and SDL.

Evaluation

At the time of the agreement, the FWS makes a written finding that the target species will receive a sufficient conservation benefit from the activities covered in the CCAA. Once the agreement is in effect, management standards cannot be raised, even if expected benefits do not materialize.

Project Area

Potentially the entire area encompassed by the three planning regions, or some portion of that area.

Priority Assessment and Special Considerations

Highest priority. As noted above in "Prerequisites for Implementation," conservation strategies may not be implemented on private lands if protections against further regulatory burdens are not provided. This may be particularly important for ranchers and other property owners whose economic status might be compromised by new and unforeseen restrictions on land use. An important consideration to ranchers is that comparable protections exist for federally leased grazing lands as for private lands. Since a CCAA cannot apply to BLM lands, the FWS and BLM must negotiate and provide separate and sufficient management assurances, similar to CCAA provisions, that would also apply to federal lease lands.

Parties responsible

The FWS should take the lead in developing and promoting a CCAA for southeast and east-central New Mexico, with principal cooperators including the NMSLO, NMDGF, and BLM.

Parties affected

Voluntary participation would be open to state agencies and all private parties in the area covered by the agreement.

Funding

Administrative costs would be assumed by the various agencies. A CCAA does not provide financial incentives to property owners—these must be sought through other mechanisms.

Pathway 4: Work towards reestablishing LPCs in southeast New Mexico

- Conservation Strategy 4.1: Identify, manage, and restore potential habitat areas in southeast New Mexico.
- Conservation Strategy 4.2: Establish a captive propagation and LPC reintroduction program in southeast New Mexico

Pathway overview: Opportunities and challenges

The Isolated Population Area (IPA) south of Highway 380 in Lea and Eddy counties is the southernmost portion of the LPC's geographic range, and some reports suggest that LPC populations were never as abundant or stable in this region as in the core of the range further to the north. However, this region has long been considered part of the historical range of the LPC in New Mexico. LPC habitat in the IPA has been negatively impacted by a number of factors, including recent years of drought. This habitat is also highly fragmented, in part due to the long history of oil and gas development in the region. Despite this history, LPC populations expanded in the relatively wet 1980s, and numerous leks were present. Rapid declines began in 1989. In recent years, only one lek, near Eunice, has remained active, though scattered sightings of LPCs have been reported in other locations.

In its most recent review of the candidate species status of the LPC, the FWS specifically noted its concern that further disturbance and fragmentation on remaining undeveloped BLM lands in southeast New Mexico may preclude eventual population recovery in this region. The Working Group shares this concern, and has outlined a number of strategies aimed at reversing habitat loss and population declines. LPC recovery in the IPA has two basic requirements. Somewhere in the region, habitat areas must be preserved and/or restored that have the capability of supporting one or more viable LPC populations. Strategy 4.1 addresses this need, making reference to applicable strategies described in other Pathways. It reviews efforts already under way to identify important remaining LPC habitat in the IPA, and management options pertaining to oil and gas development from Pathway 2.

The second requirement is that birds eventually reoccupy whatever suitable habitat has been provided. With this goal in mind, and also as insurance against the possibility of catastrophic population declines elsewhere, the Working Group has proposed that a LPC reintroduction program be carried out, coupled with a captive propagation facility in the Carlsbad area. Considerable progress has already been made in planning this effort, which is described here in strategy 4.2. The Working Group believes that coordinated pursuit of these two strategies will greatly accelerate the return of the LPC to the southern portion of its range in New Mexico, and thereby address one of the major concerns expressed by the FWS in its finding the species warranted for federal listing.

Conservation Strategy 4.1: Identify, manage and restore potential habitat areas in southeast New Mexico

As noted above, the LPC is currently absent, or almost so, from the Isolated Population Area (IPA) in Lea and Eddy counties (see Maps 2 and 3). The extent of contiguous LPC habitat in this region has been reduced by drought, development, and changing land uses. However, scattered habitat areas of varying size remain, and may provide suitable habitat for nesting, brood-rearing, foraging, and dispersal. In some of these areas sporadic sightings of LPCs have been recently reported, but most are of a size that will not currently support viable populations.

Future reintroduction or natural expansion of the LPC back into the IPA necessitates that some of these remaining habitat areas be brought into some form of protective management. This is particularly important for areas that have been determined to have high conservation value, and that occur within a surrounding landscape matrix where restoration and re-occupancy may occur. The Working Group recognizes, however, that not all remaining patches of undeveloped rangeland warrant such management protection. There may be little biological benefit in preserving rangeland fragments that are highly impacted or surrounded by active development.

Landscape Analysis

The group has recognized a pressing need for a thorough biological inventory and habitat assessment of the IPA, coupled with an analysis of current and anticipated future trends and locations of oil and gas development. Such efforts have been ongoing since before the formation of the Working Group, and have continued with the goal of identifying possible sites for LPC reserves, other habitat areas of conservation value, and areas where development should not be limited by conservation considerations.

Habitat mapping across a broad area is being carried out through the use of aerial photographs and a variety of biological survey methods at specific sites. Thorough LPC surveys on state, BLM, and private lands are particularly important to complete this process. Access to some private lands has been denied in the past. Gaining access will require a coordinated effort to negotiate with and build the trust of landowners. This should include discussions of protections available from the FWS in the event of future listing (see Conservation Strategy 3.4). The proposed Eastern Plains Conservation Coordinator (see Pathway 8) should play a lead role in facilitating such efforts.

Tied to the survey and habitat review process must be consideration of the potential value of particular areas to the oil and gas industry. As a general principal, economically important areas should not be placed off limits to development or under restrictive lease stipulations without strong biological justification. Prioritization of areas for LPC conservation or energy development should occur through a collaborative assessment process involving both agency and industry representatives.

Fairly early in its negotiations, in the summer of 2003, stakeholders identified a number of general areas in the IPA that were thought to have the greatest potential for LPC habitat, and where further biological and economic assessment was warranted. Subsequently, analysis based on aerial photographs and ground-based site assessment by the BLM Carlsbad Field Office identified and mapped a set of 17 areas with habitat characteristics favorable for LPCs. Many of these coincided with the general areas already identified by the Working Group. In some cases, however, industry representatives felt that the CFO analysis rested too exclusively on vegetative composition and structure, and did not factor in the degree of existing development and economic values.

In Conservation Strategy 2.1, as part of the recommended leasing guidelines for the IPA, the Working Group recommends that further habitat suitability analysis be conducted in the IPA, focusing on the 17 areas previously identified by the Carlsbad Field Office as having habitat that may be of value to LPC recovery, and on areas where LPCs have recently been sighted. This analysis should be completed by January 1, 2007, or sooner. Agencies and industry should work together to expedite the habitat analysis, and to ensure that sufficient manpower and resources are available to meet the target deadline.

Focus areas should be prioritized for reclamation potential, and for potential to maintain re-established LPC populations over time. An advisory committee of stakeholder representatives should be formed to work with and offer input to BLM regarding prioritization of areas, and subsequent management recommendations. Areas determined to be lacking high conservation value should be eliminated from further consideration for special management.

Conservation and Management Recommendations for the IPA

LPC Reserves

In Conservation Strategies 2.1 and 3.2, specific recommendations are made regarding the establishment of new LPC reserves in the IPA. LPC reserves should consist of at least 4 square miles (2560 acres) of contiguous habitat that is predominately shrub/grassland on sandy soils. It is desirable that the surrounding 12 square miles (7680 acres) be managed with major considerations for LPC habitat, through the various strategies described in Pathways 1 and 2. LPC reserves may be located on public or private lands. It is understood that, initially, not all of the acreage in and around a LPC reserve area may be suitable LPC habitat, but that the standards for LPC reserves may be achieved in these areas over time through appropriate management.

It is recommended that two new areas or combinations of areas that can function as LPC reserves and sites for LPC reintroduction, be established in the IPA/Carlsbad area. These should be located within predominantly suitable habitat areas large enough to support viable LPC populations and meet other criteria specified in Conservation Strategy 3.2. It is recommended

that the WIPP site serve as the location of one such reserve (see Conservation Strategy 4.2). Potash enclaves and private lands that may be available from willing sellers should be considered as a second possible reserve location.

Other Habitat Areas

Smaller or more isolated blocks of habitat, not meeting the criteria for LPC reserve areas as described above, may still be important to future LPC recovery in the IPA. These may be considered building blocks around which restoration activities may be focused and, over time, larger areas of suitable habitat may be established. Areas falling into this category are to be identified through the process of site analysis and prioritization described above under "Landscape analysis".

In Conservation Strategy 2.1, the group recommends that BLM should pursue a range of options to maintain habitat value in areas determined to be of high conservation importance. These options include guided development on existing leases through the use of PODs and voluntary agreements (as described in Conservation Strategy 2.2,) lease stipulations, deferral of new leasing in areas determined to have value for LPC recovery, and other strategies. Management approaches will be determined and pursued as appropriate, on a case-by-case basis. Note that some areas that may be important to LPC recovery may already be receiving management protection under guidelines adopted for the Sand Dune Lizard.

Reclamation

The group recommends that coordinated efforts to reclaim and restore habitat in previously developed areas be carried out when and where opportunities arise, as described in Conservation Strategies 2.2 and 2.3. Priority locations are areas in and around LPC reserves and other important habitat areas, and locations where restoration can help re-establish connectivity between isolated habitat blocks. In these areas, specific restoration and management practices should be determined and implemented on a case-by-case basis.

Management Guidelines for Mineral Leasing and Development

The following list summarizes the recommended leasing and development guidelines for the IPA, previously stated in Conservation Strategies 2.1 and 2.2.

1. In occupied habitat in the IPA/Carlsbad area the group recommends deferring new leasing with surface occupancy of state and federal minerals. Federal leasing with a No Surface Occupancy (NSO) stipulation may be allowed.
2. Once the recommended LPC reserves are established, further surface occupancy leasing of fluid minerals would be deferred in these areas.
3. Additional habitat areas considered important to future LPC recovery in the region, as may be identified and agreed to by processes described above, may be subject to a range of management options as discussed in Conservation Strategy 2.1. If recovery potential exists in these areas, the parties will institute adaptive management practices.

4. Deferments would remain in place pending realization of criteria to be determined. Future leasing in occupied or other protected habitat would be linked to the status of the species and/or habitat in New Mexico, as identified in the annual FWS candidate notice of review and other periodic agency review.

5. In areas that have already been leased, development may proceed at the discretion of the lease holder. In sensitive habitat areas and where existing LPC leks may be affected, the group recommends that lease holders consider various "least impact" options, including choosing to forego development until a later date and/or use of directional drilling to avoid surface disturbance. When and where these options are not considered feasible, voluntary compliance is encouraged to limit new surface disturbance and minimize development impacts in LPC habitat, using strategies discussed in Conservation Strategy 2.2.

6. For existing federal mineral leases BLM may employ negotiated Conditions of Approval (COAs) and Plans of Development (PODs) to help ensure orderly development with a minimum of surface impact. These requirements should not be used to prevent development from moving forward at a reasonable pace. Included in COAs and PODs may be specification of various strategies for minimizing impacts associated with new development, and for plugging wells and reclaiming developed areas upon depletion.

7. Existing timing and noise stipulations, such as are currently in place on federal mineral leases in LPC areas, should be maintained only as needed. These stipulations are intended to prevent disruption of LPC leking and nesting by activities associated with energy exploration and development. Stipulations should apply only in areas where LPCs are present, as indicated by sightings or survey reports within a period of 2 years. Exceptions should be considered on a case by case basis. In areas where adequate surveys over two years have not detected LPCs, stipulations should be waived. They should be re-applied if LPCs reappear.

Conservation strategy 4.2: Establish a captive propagation and LPC reintroduction program in southeast New Mexico

Description

The Working Group recognizes that identifying and protecting remaining LPC populations and important habitat areas are priorities for immediate action in southeast New Mexico. However, the group also believes that a program of captive propagation and/or managed reintroduction may be of great value in speeding the return of LPCs to abandoned areas. Help and guidance in developing this strategy is being sought from members of the LPC Interstate Working Group, and from experts associated with the captive propagation of the Atwater's Prairie-Chicken in Texas.

Captive propagation can provide a source population for reintroducing birds to unoccupied portions of the historic range. It can also provide some insurance against unexpected, catastrophic declines in existing wild populations. The group believes that a sound and cautionary approach is to begin development of a captive propagation program now, alongside other efforts to protect and improve habitat, and while core LPC populations appear to be stable.

Having a capacity to carry out captive propagation and release may in the long term enhance the benefits of habitat protection and improvement strategies, and help speed population recovery.

The introduction of birds transplanted from other areas is a second option for re-establishing LPC populations in the IPA or elsewhere. Although LPC transplant efforts have failed in the past, no such attempts have been made using the full array of technical and biological knowledge now available. The Working Group believes the transplant option has great promise and should be explored, but that careful consideration must be given to the possibility of negative impacts of such a program on source populations.

Captive propagation and reintroduction will require a period of research and development before achieving positive results. Members of the Working Group have explored various options for captive breeding facilities and new LPC reserve areas for reintroduction, focusing on the Waste Isolation Pilot Plant (WIPP) site near Carlsbad. This location can only be considered pending Department of Energy (DOE) approval. The breeding facility and the reserve area may be considered separate but related project elements, which may be developed independently or in tandem. The WIPP site offers good LPC habitat over a fairly large area (approximately 10,000 acres) in a managed setting in which other activities are limited or restricted. Surface area would be made available by the DOE, which owns and manages WIPP facilities. A reserve at the WIPP site would help meet the important goal of securing new protected areas for LPC management in southeastern New Mexico (see Conservation Strategies 3.2 and 4.1).

Reintroduction at WIPP or elsewhere could be accomplished by the managed release of LPCs reared in captivity or transplanted from other areas. An initial goal for the captive propagation project would be to populate WIPP lands with LPCs produced at a facility located on-site. If such a facility can be developed, reintroduction on WIPP lands would be just the first step of a long-term strategy for reintroducing LPCs to various locations throughout their historic range.

A more detailed scientific and feasibility analysis of captive propagation and transplant reintroduction is needed. Critical to the success of this strategy will be the development of a technical capacity to breed, raise, transport and successfully release LPCs. Ensuring genetic diversity in any re-established population must be a prime consideration. This effort will require extensive coordination among state and federal agencies, and the involvement of outside experts with experience in captive propagation of prairie grouse. Construction and management of the facility should be undertaken by a private company with a record of success in other projects involving gallinaceous species. Considerable funding will be required, as will the availability of sufficient acreage for both the propagation facility and a reserve area large enough to support a viable population.

Conservation Benefits

Captive propagation and/or transplanting can increase the effectiveness of other conservation and recovery efforts, while providing insurance against catastrophic declines. Establishing reserves and reintroducing LPC populations in southeastern New Mexico will expand the occupied range of the species, and are considered necessary components of LPC recovery.

Project Area(s)

Initial planning for this strategy has focused on the WIPP site because of the availability and known desirable attributes of this location.

Priority Assessment and Special Considerations

The group has agreed to elevate captive breeding to priority status, with the understanding that this must not be seen as an alternative to habitat protection. Members are in general agreement about the potential value of WIPP lands as a location for one of several LPC reserves in southeastern New Mexico. Other possible locations should continue to be explored. Funding for this strategy should not decrease or detract from funding for more pressing and immediate needs, particularly efforts to maintain isolated or threatened populations and habitat areas. Any attempt to establish a new LPC population at the WIPP site, whether by transplant or captive propagation, should be accompanied by strong efforts to provide habitat connectivity with existing populations to the north and with other reintroduction sites (see Conservation Strategy 4.1).

Parties responsible

Potentially and pending approval, DOE for matters relating to the WIPP site. NMDGF for matters relating to LPC reserve areas and reintroduction efforts. This strategy will also require extensive coordination with BLM and the involvement of outside experts and private contractors.

Parties affected

On WIPP lands, this project may significantly impact adjacent property owners and grazing lessees. Appropriate safeguards and compensation must be provided.

Funding

At WIPP, if approved, DOE would provide surface area and is a possible source of additional funding. Support for facility construction may be forthcoming from the oil and gas industry. Additional funding may be provided by private sources, philanthropic organizations, and sportsmen's groups.

Pathway 5: Reduce other causes of disturbance and mortality

- Conservation strategy 5.1: Seek to reduce mortality by predation, when and where it will be most effective in contributing to long-term population viability
- Conservation strategy 5.2: Reduce vehicular mortality and disturbance through road closures and ORV management
- Conservation Strategy 5.3: Reduce mortality from unlawful hunting and accidental shooting
- Conservation strategy 5.4: Reduce winter mortality by planting grain crops in selected areas.

Pathway overview: Opportunities and challenges

To a large degree, the impact of various sources of disturbance and mortality on LPCs are mediated by habitat quality. In fragmented landscapes or areas with poor vegetative cover, LPCs are more vulnerable to predation and various forms of human disturbance. Many of these factors may be best addressed through efforts to protect and improve habitat; however, an additional set of strategies exists for boosting recruitment by directly targeting specific sources or agents of LPC mortality, or of reduced nesting success. While none of these strategies alone may have a major impact on the status of LPC populations, cumulatively, and in concert with other efforts, they may be significant in helping tip the balance of annual births and deaths in a positive direction.

Positive and negative aspects of predator control have been debated by the Working Group. The effectiveness of this strategy may be limited by the diverse array of birds, mammals, and reptiles that prey upon LPC eggs, chicks, and adults. Raptors, which account for the majority of predation in some studies, are protected by law. Control efforts targeting coyotes may have a positive or negative effect, depending on how a reduction in the coyote population might affect densities of other mammalian nest predators. Nevertheless, the group agrees that predator control may be a useful short-term strategy in some circumstances. It may sometimes help protect small or scattered populations, in areas of limited cover, pending improvements to habitat. In such circumstances predator control may be applied on an experimental basis, with close monitoring of the population responses of target and other species.

Poaching or inadvertent shooting by hunters accounts for some LPC mortality, and may be reduced through a campaign of education and enforcement. Disturbance of lekking or nesting activities by cars and ORVs may be significant in some areas, though data on such impacts are lacking. Closing some roads to public use and enforcing ORV restrictions in key habitat areas may be an important strategy for protecting some LPC populations. Finally, although food scarcity is not thought to be a significant source of mortality for LPCs, the planting of grain crops as winter forage may help boost survival rates in some populations, particularly during times of drought or resource scarcity.

Conservation Strategy 5.1: Seek to reduce mortality by predation, when and where it will be most effective in contributing to long-term population viability

Description

Sooner or later most LPCs succumb to predators, making predator control an intuitively appealing approach to increasing annual survivorship (Schroeder and Baydack 2001). However, a number of factors should be considered before such a strategy is adopted. A wide variety of mammals, birds, and reptiles are known to sometimes prey on LPC adults and chicks, or raid nests for eggs. Some are protected by law and so cannot be targeted for traditional control efforts. Reductions in mortality rate from one predator may be compensated for by increases in predation by other species.

Mortality on LPCs can be caused by a wide variety of predators including snakes, skunks, ravens, foxes, coyotes, and raptors. Studies suggest that predation on adults and juveniles is

highly concentrated in the nesting and brood-rearing season. In Roosevelt County, half of annual female mortality occurred in the month of May, demonstrating the vulnerability of nesting hens. Over 40 percent of male mortality also occurred in the March-May leking and nesting season (Wolfe and Patten 2003). In Kansas, of 109 adult LPC mortalities for which a cause was determined, 66% were due to predation by mammals and 19% due to predation by raptors (R. J. Robel, pers. com.). In Oklahoma, 25% of 100 mortalities were attributed to predation by mammals and 33% to predation by raptors (Wolfe et. al 2003). In the New Mexico study cited above, it was thought that mammalian predators accounted for more losses than avian predators, but exact numbers could not be determined. These numbers suggest that risk from different kinds of predators may vary greatly at different locations, and site-specific studies are needed.

Avian Predators. A number of avian predator species are present in southeast New Mexico during the LPC breeding season including Chihuahuan Raven, Cooper's Hawk, Red-tailed Hawk, Ferruginous Hawk, Prairie Falcon, Northern Harrier, and Great-horned Owl. The extent of predation accounted for by any or all of these species is unknown. High rates of predation by raptors have been demonstrated in other locations and for other prairie grouse species, but not for LPCs in New Mexico.

All of these avian species are protected by law, making traditional predator control efforts impossible. However, efforts to discourage raptor nesting and perching in the vicinity of leks and LPC nesting areas remain an option. This could be accomplished most effectively by the elimination of trees, power poles and other vertical structure from these areas. The introduction of such features into prairie landscapes has been thought to increase predation rates, and also cause habitat avoidance (Bidwell et al. 2001, Robel et al. 2004). However, such a strategy may not be considered technically or economically feasible in some areas. An alternative is fitting power poles with deterrent devices to prevent raptor nesting. This may be worth attempting, on an experimental basis, in any area where predation by nesting raptors is known to be a problem. Such a strategy would not necessarily affect the use of structures by hawks as hunting perches, however, and would certainly not affect aerial foragers such as Northern Harrier.

Mammals and snakes. Terrestrial predators that may be sources of LPC mortality in New Mexico include raccoon, striped skunk, ground squirrel, coyote, badger, fox, and bullsnake. Effects of trying to control any or all of these species are unknown. Some potential nest predators may themselves be limited by predation by a more dominant predator species. Control of the dominant predator can allow these other predators to increase, resulting in an unintended increase in total LPC mortality. A similar unintended ecological consequence of predator control may occur if there are large population increases of rodents and rabbits that may have a negative effect on the vegetation of LPC habitat. It is generally agreed that the best predator defense LPC's have is quality vegetative cover in which nests and broods can be successfully concealed.

Despite these drawbacks and concerns, however, predator control may be beneficial in some circumstances. Use of predator control should be carefully considered as a strategy for protecting isolated leks and populations, where maximizing annual recruitment is vital to maintaining population viability. Control efforts can only be considered successful if reduction in one or more predators, such as coyotes and foxes, reduces total mortality on LPC eggs,

hatchlings, and nesting hens. This strategy may initially be pursued on an experimental basis, with careful monitoring to assess ecological outcomes.

Conservation Benefits

Potentially, predator control could contribute to preserving small, isolated populations subject to significant predator-caused mortality.

Project Area(s)

Predator control should only be considered in the SSPA and the IPA. Control efforts should focus on the areas where most nesting occurs—within 1.5 miles of active lek sites.

Priority Assessment and Special Considerations

This strategy has limited applicability, but may be beneficial in protecting small and isolated populations. The smaller a population is, the more it is affected by the loss of any individuals. Disturbance to nesting and brooding LPCs from control methods should be minimized. In any application of this strategy, effects of control efforts on predator and small mammal communities, and on LPCs, should be closely monitored.

Parties Responsible

NMDGF, BLM, USDA Wildlife Services.

Parties Affected

Landowners and ranch operators.

Funding

NMDGF, BLM, oil and gas developers, ranchers.

Conservation Strategy 5.2: Reduce vehicular mortality and disturbance through road closures and ORV management

Description

Nesting success and recruitment of young into the LPC population has been identified as a key element in enhancing the conservation of the species in southeastern New Mexico. A number of conservation strategies are directed at enhancing nesting success and protecting nesting and brood rearing habitat. These include maintenance of cover and food production, avoiding surface disturbance within 1.5 miles of leks, and minimizing disturbing activities during key periods in the bird's life cycle. This conservation strategy focuses on minimizing noise disturbance and intrusion to LPCs during sensitive periods of the year, by managing off-road vehicle (ORV) use and road access in key areas.

Management of ORV use and road access issues will include:

- Restriction of recreation ORV use on public land in the planning area to public roads, or areas designated for ORV use.
- Identification of existing ORV designations and access issues in key LPC areas where those activities could adversely affect populations or habitat

- Evaluating the adequacy of existing designations and access management for each key area.
- Asking appropriate management authorities to adjust designations or access if designations are lacking or are inadequate, or access to key areas is creating adverse effects. In the case of BLM-administered lands, adjustments to ORV designations or road closures will generally require an amendment to the Resource Management Plan (RMP). Emergency closures can be implemented for serious issues; however, the BLM would need to ensure there is RMP conformance to continue an emergency closure beyond a two-year period.
- Surface management agencies will be asked to perform adequate enforcement of ORV designations or road closures and monitor ORV use in key areas to determine if impacts are occurring.
- Conformance with ORV designations or road closures may require additional signing, public awareness, enforcement, and rehabilitation of roads that are permanently closed.

Conservation Benefits

Limiting disturbance to nesting activity and very young birds will enhance nesting success and recruitment of birds into the population. Additionally, limiting ORV use to existing roads and trails and implementing selective road closures will reduce impacts to vegetation in key habitat areas.

Project Area(s)

This conservation strategy potentially applies to all active LPC population areas on public lands, or where private landowners choose to participate. ORV designations and road closures will be considered for key LPC areas and seasons to minimize adverse impacts to LPC populations and habitats. Key areas include core areas, reserves, and selected scattered population areas usually within 1.5 miles of LPC lek sites. Part of this proposal is to identify key areas where ORV management and potential road closures would enhance the conservation of the species.

Priority Assessment and Special Considerations

This strategy could yield significant benefits if areas identified where LPC breeding, nesting, or brood-rearing activities are subject to ORV disturbance. How ORV or road closures are managed will vary with the authorities of the surface management entity or landowner. Special designations or road closures must conform to the authorities and processes of the surface manager or landowner.

Parties responsible

Regulating ORV use and implementing road closures could occur on any land status (federal, state, or private) at the discretion of the appropriate surface management authority.

Parties affected

ORV enthusiasts are the primary user group that would be affected. However, road closures could affect any land user in the area. Impacts from road closures are likely to be limited due to the fact that the roads most likely to be closed would be duplicative access roads and limited to those ways that are creating resource damage within 1.5 miles of lek sites. Other affected

interests would be surface management entities or landowners including BLM, NMSLO, private landowners, and possibly county governments.

Funding

Funding for ORV management and road closures would be primarily borne by the surface management agency. If designations and closures are done as part of a larger conservation effort, additional grant or cost share funds may be available to assist with planning and implementation costs.

Conservation Strategy 5.3: Reduce mortality from unlawful hunting and accidental shooting

Description

Dove and quail hunting are popular in some areas inhabited by LPCs. Although they differ in size and description, LPCs might be accidentally shot by dove or quail hunters who did not take the time for proper identification. In addition, some might illegally harvest LPCs because they are rare and therefore valuable. Both cases represent additional mortality that might not be replaceable, particularly in small populations with low recruitment.

Three steps could successfully reduce this source of mortality. First, posters informing hunters of the differences between LPC and other upland gamebirds, and of penalties for shooting LPCs, should be distributed at sporting good outlets throughout the LPC range prior to fall hunting seasons. Second, areas where dove and quail hunting is popular and LPCs reside need to be identified. Third, these areas should be patrolled by NMDGF officers with increased intensity when most bird hunting occurs. Increased patrols would best be focused at the start of dove and quail seasons and on long weekends when more hunters are likely to be in the field.

Conservation Benefits

As populations decline and become more scattered, all losses of individuals become important. Reducing this source of mortality could result in more hens that successfully nest. The benefits could be exponential. A hen that is saved from accidental shooting might produce 10 chicks the following spring, half of which might be recruited into the population. One of those new recruits might travel to a neighboring population and contribute to genetic interchange.

Project Area(s)

Emphasis to reduce this source of mortality should be on public lands with high concentrations of hunters that are also inhabited by small and isolated populations of LPCs. Efforts should secondarily be focused where LPC populations are larger and are openly accessible to the public.

Priority Assessment and Special Considerations

While not of highest importance, this strategy should reduce annual LPC mortality in some areas. Priority areas should be chosen through consultation among those knowledgeable

regarding distribution and abundance of hunters (local NMDGF conservation officers, hunters) and LPCs (agency biologists).

Parties Responsible

NMDGF field operations, NMDGF public affairs, hunters, license vendors.

Parties Affected

Hunters

Funding

NMDGF for increased patrols and distribution of informational posters.

Conservation Strategy 5.4: Reduce winter mortality by planting grain crops in selected areas

Description

Generally, forage is not a limiting factor for LPC populations. Like most upland bird species, LPC populations are limited by recruitment (chicks surviving to reproduce) and survival is not usually determined by available food. Nevertheless, there are limited circumstances in which cultivated crops may boost over-winter survival of LPCs and help sustain populations over time. Isolated populations that are small and located in poor habitat are less likely to produce sufficient numbers of young that persist over time than are large populations in high quality habitat. Harsh weather, such as prolonged or severe winter, may increase mortality such that these vulnerable populations disappear. The presence of winter grain or foliage can provide needed energy to improve the chances of survival for such populations. Crops such as grain sorghum and alfalfa are used preferentially by LPCs and should be left as waste grain, at the corners of pivot irrigated fields and along otherwise unused edges. This strategy explicitly does not promote the conversion of healthy rangelands into cultivated crops (a significant threat to LPC habitat), but rather supports maintaining crops where they may provide the most benefit.

Conservation Benefits

Conservation benefits may be limited, but could be particularly important for sparse and scattered populations during times of extreme stress such as severe cold, ice, or snow. Any strategy that boosts over-winter annual survival will be of benefit, especially in areas where LPC numbers are low.

Project Area(s)

Primarily the Sparse and Scattered Population Areas.

Priority Assessment and Special Considerations

This is not considered a high priority strategy by the Working Group; in fact, it should be employed with some caution. Food plots may provide temporary protein to LPCs, but should not be used as a long-term solution to poor quality habitat. Cultivated crops alone cannot meet the nutritional needs of LPCs as no one crop contains the full complement of essential amino acids. Also, predation in agricultural areas may be high, especially if plots are small and used regularly.

Plots should be larger than ten acres in size to be of benefit, and in all cases should be located away from power lines and poles where predatory birds may roost. Finally, food crops located far from LPC habitat areas, will attract birds, at great energetic expense, to areas that do not provide for other needs, such as roosting and protection from predators. Food plots should only be encouraged where they are within one mile of lek and roosting areas.

Parties Responsible

NMDGF, NRCS, NMSLO

Parties Affected

Farmers

Funding

NRCS, FWS (PFF), NMDGF (LIP, SWG)

Pathway 6: Research, monitoring, and evaluation

A number of the conservation strategies already discussed involve or depend upon the gathering of baseline biological information about the status and distribution of LPC populations and habitat areas. In addition, all of the strategies proposed include evaluation and monitoring as a necessary tool for gauging success and improving effectiveness. Baseline data and ongoing assessment of project outcomes are the two key ingredients of adaptive conservation management.

Biological surveys and habitat monitoring

The importance of biological surveys and habitat assessment has been described in several previous sections. In addition to any specific recommendations elsewhere, LPC survey and habitat monitoring efforts should include:

- More roadside survey routes to locate additional sparse and scattered leks in north Roosevelt, Curry, and east De Baca counties.
- More intensive surveys in the Crossroads area.
- Monitoring of a random sample of all leks: 1) in south Lea and Eddy counties; 2) in southeast Chaves county south of highway 380; 3) on BLM lands in east-central Chaves County; and 4) on or near all NMDGF Prairie-Chicken Areas.
- Annual counts of numbers of leks along samples of roadside routes in: 1) north Roosevelt and Curry counties, and nearby portions of De Baca and Quay counties; and 2) in south Roosevelt and north Lea counties.
- Field monitoring of habitat conditions, every 3 years as appropriate, on a random sample of areas within 1.5 miles of: 1) all active or recently active (within 5 years) lek sites in south Lea and Eddy counties; 2) all active lek sites in southeast Chaves County south of highway 380; 3) a random sample of lek sites in north Roosevelt and Curry counties; and 4) a random sample of lek sites in south Roosevelt, north Lea and east-central Chaves counties.

Research needs

Beyond ongoing surveys and habitat monitoring, biologists have identified a number of specific research needs that, when met, can aid decision-making and increase management effectiveness. Some studies are currently ongoing; others will be developed both in conjunction with and independently of direct conservation efforts. Only study results that meet sound scientific standards should affect management policy. It should be understood, however, that management can and must proceed using the best available science, recognizing that ecological responses are never completely predictable, and definitive resolution of some issues may not be forthcoming. The mission and value of applied research is not to furnish proofs but to clarify and interpret empirical relationships with a greater degree of precision and certainty.

The following topics and issues have been identified as research needs pertaining to LPC conservation and management.

- Effects of different grazing systems or management prescriptions on LPC habitat and population parameters.
- Impacts of noise associated with oil and gas operations on LPC lek display and nesting activities.
- Impacts of roads, fences, power lines, and structures on LPCs. This includes evaluation of mortality from collisions and fragmentation effects produced by LPC avoidance.
- Community and species-specific responses to predator control.
- Routes and mechanisms of LPC dispersal.
- Natal area imprinting and nest-site fidelity in LPC hens.
- Levels of genetic diversity in core and isolated LPC populations.

Evaluation of conservation efforts

Specific recommendations for evaluating the effectiveness of different strategies have been made in some of the strategy sections. At the operational level, success in implementation can be evaluated based on the degree to which specific recommended actions have been taken, and recommended programs established. Beyond this, however, there is a desire to measure success relative to the general goals and objectives of the Working Group and of this document. At this level, "success" relates to the degree to which the status of the LPC and SDL have improved, and the degree to which existing land uses have been maintained.

The Working Group recognizes that recovery of at-risk species may be a long-term process, extending beyond the lifespan of this strategy document. Nevertheless, it is important to try to specify what long-term conservation success would look like. Under what circumstances populations of the LPC and SDL in New Mexico might be viewed as safe and self-sustaining, such that some or all of the measures proposed in various Pathways might be scaled back? Because the group's strategic goals and objectives specifically address the issue of federal listing, a finding by the FWS that the two species are no longer warranted for listing would be one strong indicator of conservation success. Specific measures of success may also relate to the status of populations and habitat in the different geographic regions—for example, an increase in the density of leks in the SSPA such that the description "sparse and scattered" no longer applies.

The Working Group is developing other, more specific criteria for measuring outcomes and evaluating the overall success of collaborative conservation efforts, and has tasked a committee to work on this. As of February 2005 this work is not yet complete. However, the group has identified a more general set of issues and criteria that should be given consideration in any measures of outcome. These include:

- The present population levels, trends, and distribution.
- The amount of quality habitat and the degree to which it is expanding/contracting.
- Climatic conditions.
- The latest and best scientific information regarding species biology.
- The degree of reclamation (successes and failures).
- The degree to which there is a viable population.
- The success of reintroduction.
- The species not being recommended for listing as threatened or endangered.
- The level of implementation compliance.
- Other important natural, social, and economic factors.
- Other unanticipated positive or negative events.

Pathway 7: Education and outreach

Effective communication among and between groups is an essential and ongoing component of broad-scale conservation efforts on behalf of the LPC and SDL. Public education and outreach is one part of this, but the Working Group recognizes a broader array of communication needs, extending between different constituency groups. The Working Group itself has undergone a lengthy educational process by which stakeholders have gradually reached more complete understandings of each other's interests. As the strategy recommendations contained in this document become implemented, it is vital that education and information-sharing be expanded in scale to involve the larger communities of ranchers, oil and gas operators, property owners, conservation advocates, agency personnel, and others who may be affected by or contributors to conservation efforts.

Public education and outreach

The annual High Plains Prairie-Chicken Festival in Milnesand is one established and effective vehicle for spreading awareness of LPC conservation needs, reaching both residents of east-central New Mexico and visitors from other areas. The festival provides outstanding opportunities for people to view leking LPCs while learning about species biology, habitat needs, and conservation status from local experts. It may provide an excellent forum for a public presentation describing the cooperative conservation efforts of the New Mexico LPC/SDL Working Group and this LPC Conservation Strategy.

Educational activities and materials such as those that have been developed for the High Plains Prairie-Chicken Festival should be made available to a broad audience in southeast and east-central New Mexico, and beyond. General information about the LPC and SDL, their conservation needs, and the strategies being undertaken to meet those needs, may be distributed

in a variety of ways. Agency public affairs departments should be called on to help prepare and distribute brochures and other materials. Press packages should be distributed to local media in conjunction with the High Plains Prairie-Chicken Festival, and upon the completion and release of this Conservation Strategy by the Working Group. The NMDGF publication *New Mexico Wildlife*, distributed as a newspaper insert, provides another excellent means of delivering news about LPC and SDL conservation to a wide audience.

Education and outreach to stakeholder groups, agencies and local governments

Beyond the level of general public education, targeted outreach to specific groups is needed. Ranchers should be made aware of specific LPC habitat requirements (including the recommended standards for vegetation contained in this document), and of the role each ranch operator may play in creating or maintaining quality habitat for nesting and brood-rearing. As mechanisms are developed for providing financial compensation for more conservative grazing, and legal protections under Candidate Conservation Agreements with Assurances, it is imperative that the ranching community as a whole be fully informed regarding these options. As strategy implementation occurs, communication with ranchers must be a two-way conversation between management agencies and ranching community.

Ongoing outreach and dialog with ranchers in the planning area may be achieved through a variety of means. Community educational workshops should be organized by agencies and/or other groups that can offer expertise on habitat management and improving rangeland health. Similarly, demonstration tours should be held on ranches where conservative grazing management and other habitat improvement strategies are being implemented. Tours and workshops may also provide information regarding possibilities for diversifying ranch operations to include non-traditional sources of revenues. These might range from ecotourism and outdoor recreation, to mineral leasing outside of suitable and occupied habitat.

Another model for keeping landowners informed, and bringing them into the conservation planning process, is the "Ranch Conversations" program organized by the High Plains Partnership for Species at Risk and the Lesser Prairie-Chicken Interstate Working Group. This or similar programs aimed at keeping landowners informed and involved in maintaining at-risk species and rural lifestyles should be continued. (Detailed information regarding the Ranch Conversations program is currently available online at: <http://www.westgov.org/wga/initiatives/HighPlains/Ranch%20Conversation%20final.pdf>).

Agencies, particularly BLM and SLO, should also take the lead in educating oil and gas operators regarding the distribution, status, and needs of the LPC and SDL. It is essential that operators understand how their activities may affect species at risk. It is equally essential that individuals and companies in the oil and gas industry understand how and why they may be affected by any regulations pertaining to leasing and development, and how they can contribute through voluntary conservation efforts as described in Pathway Two.

To meet the varied educational and outreach needs associated with species conservation, agency resources should be coordinated with the organizational and educational capacities of coalition groups and non-governmental organizations such as the Quivera Coalition, the High Plains

Partnership, Rocky Mountain Bird Observatory, Playa Lakes Joint Venture, and others. The Eastern Plains Conservation Coordinator described in Pathway 8 should take the lead in developing broad partnerships among agencies and other groups, and in seeking funding that may be available for cooperative education and outreach projects.

An important educational need is for staff training for agency personnel involved in land management, conservation, and program funding decisions at local and regional levels. The Working Group specifically recommends that training workshops be organized for NRCS field staff and coordinators in the planning region, to keep this important group apprised of conservation issues and concerns regarding the LPC and SDL, and also regarding the various recommendations of the Working Group to seek Farm Bill - related funding for high priority conservation strategies.

Finally, the Working Group recommends that the principal agencies collaborate to provide an annual public report on the status of the LPC and SDL. BLM and/or NMDGF should take the lead on this, working with the monitoring/advisory committee of stakeholder representatives described in Pathway 2. Reports should be concise, up-to-date summaries of issues affecting the species, status and trends, and progress in implementing conservation strategies. They should be issued in writing and made publicly available, and also delivered as presentations in suitable public forums such as county commission meetings in the LPC/SDL planning area.

Pathway 8: Coordinating and facilitating participation in conservation efforts

The Eastern Plains Conservation Coordinator and the New Mexico Prairie Conservation Initiative

To carry on and coordinate the tasks of conservation strategy development and implementation, the Working Group has recommended that a position of "Eastern Plains Conservation Coordinator" be established and funded. The position may be part of a larger proposed entity, the New Mexico Prairie Conservation Initiative (NMPCI). This would be a non-profit organization, working in close collaboration with NMDGF and other agencies, dedicated to conserving the integrity and function of the southern Great Plains ecosystem of New Mexico while maintaining the culture and economic base of the region. Emphasis would be on recovery and conservation of the LPC and SDL, but also on playa lakes, Black-tailed Prairie Dogs, Aplomado Falcons, Sandhill Cranes, and other sensitive and imperiled components of the ecosystem. The Center of Excellence for Hazardous Materials Management, a 501©3 community development foundation in Carlsbad, New Mexico, has offered to help launch and establish the initiative.

Guiding principles of the NMPCI are:

- **Ecosystem Management:** Consideration will be given to the effects on both the structure and function of the ecosystem.

- Landscape Perspective: Habitat conservation will focus on identifying and conserving large, connected patches of important habitats.
- Adaptive Management: All management actions will be monitored and adjusted to maximize successful conservation.

It is envisioned that the Eastern Plains Conservation Coordinator would also serve as executive director of the NMPCI, working with a 10-member management board including representatives of the FWS, BLM, NRCS, NMDGF, NMSLO, oil and gas industry, ranching industry, conservation community, and sportsmen. The conservation coordinator / executive director, with the assistance of one or two conservation biologists, would be responsible for overseeing and facilitating implementation of conservation strategies for the LPC and SDL, and for raising funds needed to achieve strategy goals. Specific duties would include:

- Recruiting interested landowners for habitat conservation projects
- Assisting landowners with preparation of conservation plans and funding proposals
- Designing and implementing monitoring to determine success of habitat projects
- Planning and overseeing needed research
- Assisting management agencies in annual population surveys
- Ensuring each year that all habitat and population data are appropriately stored and analyzed for determining progress of efforts (see Pathway 2)
- Facilitating and supporting education and outreach
- Informing funding entities and interested stakeholders of achievements

NMPCI staff would also be involved in supporting and carrying out captive propagation efforts (see Conservation Strategy 4.2).

The Working Group views the Eastern Plains Conservation Coordinator as playing an essential role in facilitating implementation of collaborative conservation strategies proposed for the LPC and SDL. Agencies and NGOs active in the region should work together to establish and fund this much-needed position, either as part of the proposed NMPCI or within some other existing NGO structure.

Pathway 9: Funding

Many of the direct conservation and support strategies contained in Pathways 1-7 require significant funding in order to succeed. Indeed, the success of the Working Group process and of this entire Conservation Strategy for the LPC and SDL depends on each project element receiving adequate funding and support from an appropriate source. Potential funding sources and mechanisms have been identified for each of the conservation strategies in Pathways 1-4, and for important support efforts such as the formation of an Eastern Plains Conservation Coordinator position. In this section, additional information on potential funding sources is presented, and an overall strategic approach to LPC and SDL conservation funding is considered.

It should be emphasized that comprehensive conservation funding is a real and immediate need. To the extent that further habitat loss or deterioration occurs, or that species experience further population declines, the cost of species protection and recovery will only increase. These

expenses would likely be maximized in the event of federal listing, due to the need for agencies and the various parties they serve to comply with ESA regulations pertaining to all federal actions that might impact a listed species or its habitat. Direct or indirect costs of listing would be borne by all agencies and stakeholder groups. For this reason, the Working Group believes that quickly and adequately funding the projects and strategies presented in this document represents the most cost-effective solution for all parties—including taxpayers—to the problems of LPC and SDL endangerment in New Mexico.

Funding for carrying out conservation strategies may be provided by existing governmental funding or incentive programs, grant or cost-share programs maintained by non-governmental organizations or private funding entities, agency budgetary allocations, or specific project contributions from affected parties. In addition, significant programmatic funding could be made available by some novel mechanism requiring approval by the New Mexico State Legislature or by Congress. The Working Group believes that all of these sources are needed, and recommends a coordinated strategy aimed at maximizing advantage from existing programs, increasing agency budgets for LPC and SDL-related activities, and securing support from policy makers for the creation of new funding vehicles.

Existing governmental funding or incentive programs

Various federal programs sponsored by the FWS and the NRCS, and state programs sponsored by the NMDGF and NMSLO, are summarized in Table 3.1. Of all of these, the Working Group believes that the NRCS EQIP program carries the greatest potential for funding conservation strategies proposed in this document and urges local and regional NRCS staff to assist in helping make these funds available. Included in this category are stewardship incentive programs run by the NMSLO and BLM that offer reduced fees on grazing leases as a reward for achieving specified management objectives.

The Working Group recognizes that available funding is limited and competition is strong for the various existing federal and state programs that provide grants or cost-share support for habitat protection. Nevertheless, coordinated pursuit of these important funding sources can result in support for a number of projects, and should be a high priority for all parties involved in the implementation of this Conservation Strategy. The Working Group strongly recommends that:

- Granting agencies (FWS, NRCS, and NMDGF) together with the Eastern Plains Conservation Coordinator actively publicize and recruit participation in the various programs available, and assist with the formation of conservation partnerships and development of project proposals.
- State funds available through NMDGF-sponsored programs be increased.
- The state office of the NRCS should increase contact with landowners, and prioritize making more Farm Bill monies available for habitat conservation for declining wildlife species, especially those in danger of federal listing such the LPC and SDL.

Existing non-governmental programs

Various existing private or non-governmental programs that provide funding for conservation-related projects such as habitat restoration are summarized in Table 3.1. This list can and should be expanded. The Working Group recommends that the Eastern Plains Conservation Coordinator and/or personnel from BLM and NMDGF seek out and publicize all

non-governmental programs that provide grants, incentives, or cost-share assistance for habitat or species protection, and should facilitate participation in these programs by assisting with the formation of conservation partnerships and the development of project proposals. Funding from private foundations, conservation organizations, and other non-governmental entities may be used to secure additional governmental funding through partnership-based cost share programs.

Project contributions by affected parties

Conservation interests

Conservation organizations may engage in fundraising for specific undertakings, such as the acquisition of lands for LPC reserve areas. Organizations that specialize in these sorts of activities, such as the Nature Conservancy, may be encouraged to pursue partnership projects with agencies and private entities that will result in protection of sand shinnery or sand sage-grassland habitat. Conservation interests can also help provide and coordinate volunteer labor for habitat restoration projects on private lands, and can assist with education and outreach efforts.

Grazing interests

Ranchers typically make cost-share, in-kind contributions to match any Farm Bill or FWS funding they may receive.

Oil and gas interests

Private producers may be expected to bear the costs of mitigation and reclamation activities undertaken along with, or as a consequence of, energy exploration and development. In addition, industry may also voluntarily provide funds to support other proactive conservation efforts.

Agency budgetary allocations

A considerable portion of the total funding for LPC habitat management, conservation, research, and monitoring comes from budgetary allocations of BLM, NMDGF, and NMSLO. Both agencies support biologists and other staff with principal duties relating to the management of rangeland habitat, and both carry out LPC surveys, monitoring and habitat assessment, and outreach activities. The NMDGF owns and administers the LPC Prairie-Chicken Areas (PCAs).

The Working Group recognizes that for these agencies to carry out their needed role in the implementation of this Conservation Strategy, budgets for activities relating to LPC and SDL conservation will have to be increased. Nothing is more critical to success, in all of the conservation and support pathways, than adequate financial backing from the principal state and federal management agencies.

A specific recommendation is that NMDGF be mandated and funded to have a program to lease important habitat areas, and in limited circumstances purchase such areas from willing sellers, for the conservation of declining species or those facing possible federal listing. This program should include associated mineral rights where necessary and opportunities for matching donations from private sources or non-governmental organizations.

Other funding mechanisms

Apart from existing funding programs, project-specific contributions, and agency budgets, at least two different novel funding mechanisms have been discussed by the Working Group.

Request for Congressional approval of a special funding allocation. The Working Group believes that immediate and coordinated implementation of this Conservation Strategy could best be achieved through the establishment of a special federal funding source specifically for this purpose. The group believes that full and immediate funding for the conservation strategies it has proposed will result in a net savings of federal dollars, when compared to the direct and indirect costs of federal listing.

Request for state legislative approval of a new funding mechanism for wildlife conservation. The state program for conserving wildlife and avoiding federal listing of species is inadequately funded, depending largely upon monies from hunters' and anglers' license fees. Conservation representatives in the Working Group recommend that the New Mexico State Legislature create a new mechanism whereby all New Mexicans contribute consistently to the conservation of the state's native wildlife.

Table 3.1. Funding Sources for Conservation Activities.

Sponsor and Program	Type of funding	Type of activity supported	Deadlines	Key requirements and additional information
Federal Programs				
NRCS: Environmental Quality Incentives Program (EQIP)	Cost share; up to 75% contribution to the cooperator by the program.	Through participation in EQIP, agricultural producers may receive financial and technical assistance in developing and implementing conservation plans which include structural and management practices intended to treat a wide range of natural resource concerns. EQIP includes programs that enhance, restore, and manage fish and wildlife populations including such practices as rotational grazing, conservation buffers, prescribed burning, fencing, brush management, and grassland restoration.	The application evaluation period is established each year. All NRCS Field Offices and FSA County Offices will accept an applications for projects.	As of 2003, three NRCS offices (Clovis, Portales and Lovington) in NM employ this program for LPC habitat management. Incentives for LPC management are approved for anyone who is accepted into the program at the following rates: Clovis = \$7.50/acre; Portales = \$7.50/ acre; Lovington = \$4.50/acre. www.nm.nrcs.usda.gov/programs/eqip.html
NRCS:Wildlife Habitat Incentives Program (WHIP)	Cost share; up to 75% contribution to the cooperator by the program.	WHIP is a voluntary program for people who want to develop and improve wildlife habitat primarily on private lands. It provides both technical assistance and cost share payments to help establish and improve fish and wildlife habitat. Projects could include including such practices as rotational grazing, conservation buffers, prescribed burning, fencing, brush management, and grassland restoration	No deadline for applications. Contact the local NRCS office.	All offices in NM can use WHIP funding for LPC habitat improvements. The NRCS National Office allocates annual funding to each state. www.nm.nrcs.usda.gov/programs/whip.html
NRCS: Grassland Reserve Program (GRP)	Cost share; up to 90% contribution to the cooperator by the program	Easements are purchased to maintain grassland habitats and prevent development such as urbanization. Wildlife species at risk are given extra points in the ranking. Contract items may not be specific to LPC habitat.	Contact local NRCS office.	www.nm.nrcs.usda.gov/programs/grp.html

Sponsor and Program	Type of funding	Type of activity supported	Deadlines	Key requirements and additional information
NRCS: Wetland Reserve Program (WRP)	Cost share; up to 100% contribution to the cooperator by the program.	Restoration of wetlands damaged in the past. Equal amounts of wetland and upland can be accepted into the program. Easements or cost-share are used to restore damaged wetlands. LPC may benefit in playa situations near leks.	Contact local NRCS office.	www.nrcs.usda.gov/programs/wrp/
NRCS: Conservation of Private Grazing Land (CPGL)	Technical assistance.	Provides technical, educational, and related assistance to private landowners, for better grazing land management; protecting soils, conserving water, and providing habitat for wildlife.	Contact local NRCS office	www.nrcs.usda.gov/programs/cpgl
NRCS/FSA: Conservation Reserve Program (CRP)	Cost share; up to 50% contribution to the cooperator by the program.	Cropland on highly erodible land is retired and planted to permanent habitat for wildlife. A portion of the program is devoted to buffers along streams and applies to rangeland. Adjustments to the program allow for limited grazing. New contracts for wildlife habitat require planting native plant mixes, including grasses for LPC nesting.	No deadline for applications for the buffer program. Contact local county FSA office.	www.fsa.usda.gov/dafp/cepd/crp.htm
NRCS/FSA: Conservation Reserve Enhancement Program (CREP)				
NRCS/FSA: Debt for Nature Program	Cost share; up to 100% contribution to the cooperator by the program.	Debt reorganization program to forgive debts owed on farm and ranch loans. In exchange for placing a portion of the affected land in an easement for wildlife habitat, the owner will be allowed to eliminate the debt on that land. Management of the affected land can be assigned to NMDGF, FWS, NRCS or others.	Contact local FSA office.	Contact local FSA or NRCS offices or USDA Service Centers. www.fsa.usda.gov/pas/publications/facts/html/dfn01.htm

Sponsor and Program	Type of funding	Type of activity supported	Deadlines	Key requirements and additional information
FWS: Partners for Fish and Wildlife Program	Cost share; up to 90% contribution to the cooperator by the program. Maximum of \$25,000 per project	The Partners Program provides technical and financial assistance to private landowners and their non-federal partners to voluntarily restore wildlife habitats on their land.	Applications reviewed in fall, funding decisions made in spring of each year.	http://partners.fws.gov http://partners.fws.gov/pdfs/NM-needs.pdf
FWS: Private Stewardship Program	Cost share; up to 90% contribution to the cooperator by the program.	This program focuses on conservation efforts that protect federally listed, proposed, or candidate species, or other at-risk species.		http://endangered.fws.gov/grants/private_stewardship.html
FWS: High Plains Partnership (HPP)	Variable; Other federal and state programs provide funding through the HPP	Projects on private lands designed to improve the status of High Plains species at-risk so as to reduce or remove their need for protection under ESA.	Variable	Contact FWS. http://mountain-prairie.fws.gov/endspp/hpp/
BLM: Challenge Cost Share Program	Matching cost share(1:1 non-federal match) with appropriated funds	Activities include habitat improvement, studies, and surveys.	Part of BLM budget process, proposals normally have to be submitted a year in advance normally by June.	Interested parties can contact the appropriate BLM field office where the activity is proposed.
State Programs				
NMDGF/FWS: Landowner Incentive Program (LIP)	Grant payments with need for matching funds and/or reimbursement of actual expenses	Activities eligible for funding includes removal of exotic plants, fencing to enhance important riparian habitats, land restoration to protect habitats and improve the environment for native plants and wildlife, and long-term conservation easements	Variable	States are required to provide a minimum of 25 percent non-federal share of program costs to support their programs. These funds may be provided by the state, landowner or other conservation partners. http://southwest.fws.gov/fedaid/lip.html http://southwest.fws.gov/fedaid/lip2.html

Sponsor and Program	Type of funding	Type of activity supported	Deadlines	Key requirements and additional information
NMDGF: New Mexico Habitat Stamp Program	Cost share	The program is primarily geared toward projects that enhance wildlife populations and habitat.	BLM and Forest Service submit projects through NMDGF coordinator two years in advance.	Projects are sponsored by agencies using funding provided through a habitat stamp program. www.gmfsh.state.nm.us/PageMill_TExt/Hunting/hstamp.html
NMDGF: Non-game Share With Wildlife	Grant	The program funds four general categories: research, public education, habitat protection, and wildlife rehabilitation.	Variable	www.gmfsh.state.nm.us/PageMill_TExt/NonGame/swwh.html
NMSLO: Land Maintenance Fund	Cost share	Habitat improvements, surveys and research	Variable	www.slo.state.nm.us
NGO programs and foundations				
National Fish and Wildlife Foundation (NFWF) Grants	Cost share, grant	Conservation of fish & wildlife and the habitat on which they depend; projects that work proactively to involve other conservation and community interests; projects include such things as habitat improvements, studies, surveys.	Pre-proposals June 1 and October 15. Full proposals 6 weeks later.	Requires non-federal 1:1 match in dollars or in-kind services. www.nfwf.org/programs/programs.htm
Playa Lakes Joint Venture (PLJV) Cons. Grants	Cost share, \$25,000/year limit	Conservation projects in three categories: habitat management, research, and outreach.	November 15 and March 15	1:1 match required, greater contribution from project partners preferred. http://www.pljv.org/conservation04.html
Conservation Fund Conservation Program	Grants and assistance programs	The Fund provides a comprehensive range of conservation services to government agencies, corporations, foundations, nonprofit organizations, and individuals. Projects include land identification and acquisition, mitigation and disposition, management advice, and training.	Variable	http://www.conservationfund.org/

Chapter Five: Recommendations for Sand Dune Lizard Conservation

5.1 Strategy orientation

Conservation recommendations for the SDL were formulated by a subcommittee of stakeholders and SDL biologists, and approved by the entire Working Group. The format of these recommendations differs from that of the conservation Pathways presented in the previous chapter. However, strategies for the LPC and SDL should not be considered in isolation from one another. Many elements of the conservation Pathways contained in Chapter 4 integrate with, and can help achieve implementation of, the additional specific recommendations made for the SDL. Recognizing areas of geographic overlap and common conservation needs, the Working Group discussed and formulated a number of strategies with both candidate species in mind. The goal has been a coordinated conservation strategy for at-risk species in the sand shinnery ecosystem.

Ways in which the SDL recommendations interface with Pathway strategies from Chapter 4 are noted for each item in section 5.3 below. Beyond these specific areas of overlap relating to the SDL recommendations, additional broad Pathway elements apply to both the SDL and the LPC. These were noted in Chapter 4. The pursuit of a coordinated conservation strategy that takes into account the needs of both candidate species can be facilitated by the development of:

- The development of Candidate Conservation Agreements with Assurances (CCAAs) as described in Pathway Three, Conservation Strategy 3.4;
- Implementation of coordinated education and outreach as described in Pathway 7;
- Implementation of the proposed Eastern Plains Conservation Coordinator position described in Pathway 8;
- Provision of necessary and sufficient funding as described in Pathway 9.

See all of the above sections for further details.

5.2 Landscape analysis and ongoing research

The BLM is cooperating with researchers from Texas A&M University and NMDGF to conduct a landscape analysis of SDL habitat in southeast New Mexico. This work, along with additional biological studies, will provide a broader view of how occupied, suitable, and potential habitat areas for SDLs are arranged across the landscape. The range-wide analysis will enable land managers to identify and map critical areas of SDL habitat, plan for dispersal corridors, and classify potential threats to lizard populations. The studies are focused on understanding SDL distribution and key habitat characteristics, and will result in GIS maps with habitat and land use information, and habitat suitability analyses. As with the LPC, these tools

will provide an effective mechanism with which to assess and monitor potential impacts on SDL populations. The current round of studies was initiated in the fall of 2004 and will continue through 2006.

The conservation recommendations contained in section 5.3 below make frequent reference to suitable and occupied habitat for the SDL. Pending precise definition and range-wide mapping of these areas, as described above, the terms should be understood to refer to locations identified by biologists as SDL population areas, and to shinnery oak dune areas having the characteristics of suitable habitat described in Chapter Three, section 3.7. (See Map 2 for general distribution of the SDL.)

5.3 SDL management recommendations *in order of priority*

NOTE: Research on the SDL is ongoing. The following recommendations reflect and are based upon the best available knowledge at the time they were written. As research continues and as new information becomes available, these recommendations should be adjusted and refined.

1. Threat: Application of herbicide (i.e., Tebuthiuron) for shinnery oak control in suitable or occupied habitat

Recommendation

All tebuthiuron spraying for shinnery oak control within 500 m of occupied or suitable habitat should be discontinued. Proposals for spraying of shinnery oak with non-tebuthiuron herbicides or defoliants within 500 m will be reviewed by the SDL research team (biologists from NMDGF, BLM, or other relevant agencies).

Justification

Comparisons between Tebuthiuron treated and adjacent untreated shinnery oak habitat in the Mescalero Sands showed 70-94% reductions of SDL numbers in the treated pastures compared to the untreated pastures. Information on the effects of herbicide treatment on shinnery oak and SDL populations is found in Gorum et al. (1995) and Snell et al. (1997).

Wind and other variables can cause “overdrift” or “overspray” of chemicals that are broadcast through aerial application. To prevent this “overspray” from reaching occupied habitat, buffers of at least 500 m need to be established around occupied or suitable SDL habitat.

Coordination with other strategies

Shinnery oak management with respect to the LPC is addressed in Chapter 4, Conservation Strategy 1.4, "Shinnery oak management." Guidelines for limited use of herbicide as a tool for LPC habitat improvement reiterate that herbicide treatments should never be applied in dune areas or in corridors between dune complexes.

2. Threat: Application of herbicide (i.e., Tebuthiuron) for shinnery oak control in SDL dispersal corridors

Recommendation

Dispersal corridors of unsprayed shinnery oak flats at least 500 m wide should be retained between suitable habitat, both occupied and unoccupied, that is separated by ≤ 2000 m.

Justification

Monitoring of pitfall traps (Painter and Fitzgerald, *unpubl. data*) suggests the interdune, shinnery oak “flats” are important as dispersal corridors for juvenile SDLs and for females seeking egg deposition sites. Continued monitoring will establish when these areas are the most important, and if they are used by dispersing adults as well. A minimum corridor width of 500 m was established by consensus among experts. However, some individuals queried (L.A. Fitzgerald and H.L. Snell, *pers. comm.*) suggested that because sand dunes are a dynamic feature that move across the landscape through time it would be imprudent to consider any currently unoccupied patches of suitable habitat within the overall range or along the edge of the range as being useless to SDLs.

Coordination with other strategies

As described in SDL Threat 1, above.

3. Threat: Oil/gas exploration and extraction activities in dunal areas

Recommendation

New oil/gas well pads should not be placed in dunal areas within occupied or suitable habitat, or within 100 meters of such dunal areas. Well sites proposed in these areas should be moved to adjacent shinnery oak flats. Where a dune complex that contains occupied or suitable habitat is large (>5 acres) and there are compelling reasons, such as New Mexico Oil Conservation Division (NMOCD) requirements that may not be alleviated, new well pads should be located at the periphery of the complex, avoiding the center of the complex. See Appendix B for a description of suitable SDL habitat.

Justification

Based on long-term monitoring of the species, stable populations of SDLs are known to occur only in blowout areas within shinnery oak habitat (Degenhardt et al. 1996; Fitzgerald et al. 1997). Oil/gas wells and the associated caliche roads and well pads remove suitable habitat for SDLs. Oil and gas industry representatives have some concern about this recommendation because of the unknown extent of the size of dunal areas to be included. Mapping of dunal areas is underway, as described in section 5.2 above. Industry will review all maps upon completion and affirm their agreement to this recommendation.

Coordination with other strategies

Where the ranges of the LPC and the SDL overlap, this recommendation is consistent with and can be pursued through strategies presented in Chapter 4, Pathways 2 and 3.

- In Conservation Strategy 2.1, "Recommended guidelines for new mineral leasing," it is recommended that the existing policy of no new mineral leasing in the Roswell BLM Core Management Area (CMA) be continued. This would reduce potential development impacts in dunal areas in the large portion of the SDL range that falls within the CMA.

- Also in Conservation Strategy 2.1, additional areas of suitable and occupied LPC habitat are recommended for deferral of new leasing. This would reduce potential development impacts in an additional portion of the SDL's range where its distribution coincides with LPC habitat.
- In Conservation Strategy 2.2, "Minimizing impacts of new and ongoing energy development," strategies for managing existing leases and mitigating development impacts in suitable and occupied LPC habitat are discussed. These may also apply to SDL habitat.
- In Conservation Strategy 3.1, "Land and mineral exchanges to consolidate federal holdings in BLM core management areas," a program of land exchanges is recommended that would add to BLM holdings in the CMA. This would increase the benefit of the CMA to the SDL as described above.
- In Conservation Strategy 3.2, "Options for acquiring or designating lands for LPC reserves," the establishment of several LPC reserves is recommended. Such a reserve might also protect SDL habitat from potential development disturbance.

4. Threat: Oil/gas exploration and extraction activities—well pad density

Recommendation

Establishment of oil and gas well pads within complexes of suitable habitat should be limited so that total well pad density does not exceed 13 well pads per square mile (not to be confused with section lines).

Justification

Sias and Snell (1996) studied population densities of SDLs at various distances from active oil/gas wells. They found a statistically significant pattern of greater numbers of SDLs occurring at the Far Plots (200-220 m from well pad) compared to the Adjacent Plots (10-30 m) and the Intermediate Plots (50-70 m). They reported a mean 39.8% reduction in the SDL population density index in the Adjacent Plots when compared to the Far Plots, and a mean 38.9% reduction in the SDL population density index in the Intermediate Plots when compared to the Far Plots. These data provide evidence to conclude that oil and gas wells result in a localized reduction in lizard populations. The specific mechanisms of the observed reductions are unknown at this time (although may include habitat loss and fragmentation and H₂S toxicity); however, a lower well density will result in a lower proportion of habitat having conditions found in the Adjacent Plots, where population density of SDLs is reduced.

Well density of 13.64 w/mi² results in a predicted population reduction of 25%. SDLs were found throughout oil and gas fields, but overall population levels were 31-52% lower in oil and gas fields compared to undeveloped areas. In areas with the highest well densities (34.36 w/mi²) regression analysis predicted a 56% decline in SDL population levels (Sias and Snell 1998). Large-scale reductions in this species habitat will lower the probability of continued survival of the species.

Coordination with other strategies

As described in SDL Threat 3, above.

5. Threat: Oil/gas exploration and extraction activities – well pad size and reclamation

Recommendation

New well pad construction in occupied or suitable habitat should be kept to a minimum, and the working area of the pad should be minimized (although opportunities to drill multiple wells from one pad should take precedence). Abandoned well pads and the caliche roads that serve these wells should be cleaned of caliche, raked, contoured, and reclaimed with native sand. All out-of-service roads in occupied and suitable habitat should be reclaimed and closed to vehicle use, pending consultation with grazing permittees. Abandoned well pads and out-of-service roads should not be reseeded in dunal areas. BLM should identify ways to redistribute or stockpile caliche for future road maintenance or other uses.

Justification

Adherence to these recommendations will minimize habitat loss.

Coordination with other strategies

Strategies for mitigating development impacts and coordinating restoration and reclamation of previously developed areas are described in Chapter 4, Conservation Strategies 2.2 and 2.3, "Coordinating restoration and development of previously developed areas." These strategies may also apply to SDL habitat and are consistent with implementing this recommendation.

6. Threat: Off Road Vehicle (ORV) use

Recommendation

ORV use in occupied or suitable habitat should be limited to currently established ORV recreational areas and no new ORV recreational areas should be established within sandy areas within the geographic range of the SDL. ORV use should continue to be allowed for permitted purposes, using existing designated roads wherever possible.

Justification

Heavy recreational ORV use in arid sand dunes is known to be injurious to wildlife and its habitat (Bury and Luckenbach 1983), and has been specifically identified as one of the primary threats to other species of dune-endemic lizard species (e.g., fringe-toed lizards).

Coordination with other strategies

Strategies for minimizing ORV impacts in LPC habitat are discussed in Chapter 4, Conservation Strategy 5.2, "Reduce vehicular mortality and disturbance through road closures and ORV management," and are consistent with the implementation of this recommendation.

7. Threat: Oil/gas exploration and extraction activities – use of “thumper trucks” for seismic exploration

Recommendation

Repetitive use of “thumper trucks” (> once per 5 years) should be avoided unless poor results or new technology dictate that new surveys are needed. Thumper trucks should avoid

dunal complexes when feasible. Management (regulations, signage, barriers) should assure that two-tracks created by thumper trucks are not used as ORV roads.

Justification

SDLs are generally inactive from October to April. During hibernation or seasons of inactivity, they are immobile and unable to move about. Use of “thumper trucks” in occupied habitat during these periods of inactivity could result in direct take of SDLs. Direct take could also occur during summer months when lizards are laying eggs in underground nests that could be crushed. While repetitive thumper truck activity increases the risk of harm to lizard populations, there may be some benefit in limited seismic exploration as a way of focusing drilling activity and reducing the overall number of new well pads.

Coordination with other strategies

Management of existing leases in LPC habitat is discussed in Chapter 4, Conservation Strategy 2.2.

8. Concern: Lack of public awareness of the conservation and management needs of the SDL

Recommendation

The BLM, NMDGF, and FWS should develop a public awareness program to help disseminate information on the habitat requirements and status of the SDL. Representatives of the ranching community and the oil/gas industry should be well informed about this program, and can help to disseminate this information to others within those industries.

Justification

An accurate and unbiased compilation of the management needs of the SDL would help the public and industry understand the regulations and laws governing management by federal and state agencies, and proactively assist in precluding adverse impacts to the SDL and its habitat.

Coordination with other strategies

Education and outreach strategies regarding the LPC are described in Chapter 4, Pathway 7. These strategies also apply to, and should be coordinated with, efforts to increase public awareness of the conservation and management needs of the SDL. Coordinated education and outreach should focus on the needs of at-risk species in the sand shinnery ecosystem.

9. Concern: Oil and gas facilities maintenance and operation activities

Recommendation

Regular pipeline inspection and routine maintenance of wells should occur. Oil and gas wells and storage facilities should include safety measures to ensure operations that minimize the potential for habitat pollution in the form of oil leaks or spills. Such measures should include, but not be limited to, replacement of worn or out-of-date materials and equipment, construction of spill containment structures, removal of contaminated materials, and protection of well sites.

Justification

Regular inspection and maintenance of wells and storage facilities will minimize possible oil and gas well pollution. Although expected to be minimal, the effects of oil and gas field pollution on SDLs have not been quantified, but control or reduction (at least to the extent required to address human health and safety concerns) of this pollution would be prudent to alleviate potential threats.

Coordination with other strategies

Recommendation not specifically addressed elsewhere.

5.4 Recommendations for further research

There are several areas in which further research would provide data that can help in making management decisions to benefit the species. It is recommended that research efforts include a “joint fact-finding” component, in which study parameters are developed in collaboration among biologists, industry, conservationists, and agencies. All experimental reclamation efforts should be reviewed and monitored on a regular basis.

A. Concern: Tebuthiron treatment**Research Recommendation**

Continue to study areas previously treated with tebuthiron spraying to determine whether SDL populations have expanded to occupy the site. If there is no occupation, examine whether there can be habitat modification at the edge of the site that might result in occupation.

B. Concern: Engineering habitat**Research Recommendation**

Examine opportunities for engineering land forms to create sand dune blowouts that can sustain SDLs. Determine whether caliche removal is successful in recreating habitat. Experiment with caliche removal and on-site burial to determine feasibility and adequate depths.

C. Concern: Mitigation of development impacts**Research Recommendation**

Conduct research to determine if selective site-specific planning of infrastructure within dunal complexes can minimize development impacts such that the 13 well pads per square mile limitation could be increased.

Justification

If research findings demonstrate that on-site or off-site mitigation of impacts is possible, these measures could be applied when exceptions to the 13 wells/m² is necessary or proposed.

D. Concern: Mapping

Research Recommendation

Prioritize completion of habitat mapping to identify occupied and suitable SDL habitat.

E. Concern: Public education

Research Recommendation

Demonstrate that an effective public awareness program can lead to increased funding for SDL research and conservation initiatives.

Additional concerns that might warrant research at a later date include:

A. Concern: Oil/gas exploration and extraction activities–Hydrogen Sulfide (H₂S) emissions

Recommendation

Control measures to minimize or reduce H₂S emissions should be implemented at all well sites. Laboratory and field studies designed to identify and investigate the impacts of H₂S emissions should be implemented.

Justification

H₂S emissions are known to be toxic to wildlife, although the effects on SDLs are unknown. Until these potential effects to SDL populations can be quantified and further understood, it is prudent to control or reduce these emissions.

B. Concern: Livestock use

Recommendation

Research should be designed and implemented to study the potential impacts of livestock grazing on the SDL and its habitat. The BLM, ranching community, and NMDGF should cooperate in designing and implementing these studies.

Justification

Virtually nothing is known about the potential direct impacts of livestock grazing on the SDL and its habitat, therefore it is prudent to implement this research to determine at what grazing levels, if any, that negative impacts exist.

C. Concern: Use of management-ignited fires or wildfires

Recommendation

Research should be designed and implemented to study the potential impacts of management-ignited fires or wildfires on the SDL and its habitat. BLM, the ranching community, and NMDGF should cooperate in designing and implementing these studies.

Justification

Virtually nothing is known about the potential direct impacts of management-ignited fires or wildfires on the SDL and its habitat, therefore it is prudent to implement this research to determine to what extent, if any, that negative impacts may result from fire.

Chapter Six: Moving toward implementation

This concluding chapter briefly summarizes the accomplishments of the Working Group to date, and outlines how the collaborative conservation process will now move forward to achieve implementation under the guidance of this document and a designated Implementation Team.

6.1 Completion of Phase I: The LPC/SDL Conservation Strategy document

This LPC/SDL Conservation Strategy was completed and approved by the Working Group in May, 2005. It is considered to have utility and applicability over a five-year time frame, from 2005 - 2010. During or after that period the strategy may be revised, amended, or supplanted by additional strategic and operational planning documents produced in ongoing collaborative conservation efforts.

The strategy document outlines and prioritizes a variety of recommended programs, projects, and practices for reducing threats to the LPC and SDL, while maintaining other uses of the land. It is the result of two years of discussion and give-and-take negotiation among stakeholders. For all represented parties, it contains elements that were not considered desirable, but in the end were found acceptable, in the spirit of shared goals and collaborative problem-solving.

The strategy document identifies and addresses all principal known threats to the LPC and SDL. It is comprehensive in scope, and is offered with expectation that, when implemented, it will produce real benefits for the species concerned. It also addresses the concerns and needs of land users and property owners represented in the Working Group process, and emphasizes that for collaborative conservation to be successful, these concerns and needs must be fully taken into account.

The strategy does not spell out all aspects of how, where, and when the various recommendations will be implemented. This work still lies ahead, following the detailed strategic direction that has now been set. To move forward, the strategy asks for, indeed requires, the ongoing, active participation of all parties. A high level of involvement will be essential to the development of detailed operational planning and implementation. Members of the Working Group now bear a responsibility in carrying out the various actions the strategy recommends and to which they have agreed.

The strategy has been approved and endorsed by the Working Group, with some qualifications as reflected in the text. The LPC and SDL strategy chapters 4 and 5 have been submitted to the BLM for consideration in the current Resource Management Plan Amendment process for southeast New Mexico. The strategy as a whole should be considered the first step towards the establishment of conservation efforts sufficient to meet FWS PECE criteria, in the event that federal listing of the LPC or SDL is considered at some future date.

Publication of this strategy document marks the completion of Phase I and sets the stage for Phase II, strategy implementation.

6.2 Conclusion of the Working Group process and the role of the Implementation Team

The final Phase I meeting of the Working Group was held on May 5, 2005. The Working Group process associated with Phase I planning was concluded upon final approval and publication of the conservation strategy document.

At the final meeting an Implementation Team was established, to carry on the collaborative conservation efforts of the Working Group. The Implementation Team consists of two members from each of the principal agencies and stakeholder groups. Its function and duties are described below. The initial composition of the Implementation Team is included in Appendix B.

6.3 Phase II: Responsibilities of the Implementation Team

The Implementation Team has been established to ensure that the progress of the Working Group to date is carried forward, and that strategic recommendations are followed by concrete actions. Ultimately, successful LPC and SDL conservation depends not on the contents of a strategic plan but on the breadth and effectiveness of programs, projects, and practices implemented on the ground.

It is essential that strategy development and implementation not be viewed as the responsibility of the Implementation Team alone. The team is composed of a small number of individuals, a subset of the original Working Group. Conservation success will require the participation of a much larger group of regional planners and decision-makers, agency managers and scientists, constituency group members, and private parties. However, the Implementation Team has a crucial role to play in maintaining the open and collaborative nature of ongoing conservation efforts, and in making sure that Working Group agreements are being honored and strategies are being pursued.

Responsibilities of the Implementation Team fall into three broad categories: communication and coordination, operational planning, and strategy implementation. Various duties and functions in each of these categories are listed below. These lists are not intended to be exclusive or comprehensive. It is expected that the role played by the Implementation Team will evolve over time. Few of these functions can be achieved by the team acting alone; interaction with agencies and stakeholder groups is implicit in many of the items that follow. In such cases the team's role is to provide the encouragement, direction, and coordination needed for directives to be realized.

At the final meeting of the Working Group, it was suggested that one of the first tasks of the Implementation Team should be to consider possible ways of establishing a more formal status under some state-chartered authority. Team representatives agreed to think through what might be the best institutional format for such a charter group, and work toward attaining such status.

Communication and coordination

- Maintain active communication among Working Group constituencies. This includes use of established Working Group mailing and email lists to keep parties informed of developments, meeting dates, and other matters.
- Establish and/or serve as a clearinghouse for information concerning LPC and SDL conservation efforts.
- Organize and direct special committees that may be appointed to carry out specific research or planning tasks. Communicate the results of such committee work to all interested parties.
- Liaison with the FWS regarding the progress of conservation efforts. This includes the monitoring and framing of efforts with regard to PECE criteria.
- Convene meetings as necessary. At minimum, this shall include an annual meeting for reporting progress and exchanging information regarding all aspects of LPC and SDL conservation. This should be open and made known to all interested parties. It should include discussion of both progress and setbacks regarding the goals of species management and land user protection.
- Prepare and distribute to all interested parties an annual progress report on the implementation of conservation efforts. This should include an updated list of achievements, projects, schedules, and timelines for all participating entities. A template for this annual report is provided by the table summarizing progress to date, in Appendix A of this document.

Operational planning

- Establish overall criteria for success in conservation efforts. This is an important task to which the Working Group has already given much attention. It should be a top priority for the Implementation Team. As discussed in Chapter 4, Pathway 6, overall measures of success are needed for the conservation strategy as a whole. The questions, “where are we going?” and “how will we know when we get there?” must be answered in terms of specific, measurable criteria. While species conservation is an inherently open-ended process, parameters for “successful” conservation can be set based on a combination of scientific understandings of species population biology and value judgments regarding acceptable levels of risk, and probabilities of survival over some agreed-upon interval of time. Ongoing collaboration between scientists, land managers, and land users will be essential to this process.
- Establish immediate action priorities for LPC Pathways and SDL conservation recommendations.
- Establish and/or refine specific goals and objectives for conservation strategies. Agencies may take the lead in this, but goals and objectives should be established through discussions with all affected parties.
- Establish project-specific timelines and budgets. This applies particularly to agency-directed projects, which must be incorporated into internal planning processes.
- Prepare an implementation plan summarizing all of the above. Further planning is not the top priority, but a detailed implementation plan should be developed as work proceeds.

Project implementation

- Work with agencies to develop institutional capacities for necessary research, monitoring, evaluation, and data management.
- Initiate conservation projects and partnerships.
- Seek to acquire funding.
- Oversee and coordinate action on all strategies.

6.4 Phase II: Responsibilities of the Working Group

- Maintain communication within and across constituencies, and with the Implementation Team.
- Promote the Phase I LPC/SDL Conservation Strategy, and the recommendations it contains, to constituency members outside the Working Group.
- Take steps to carry out recommended implementation actions, as directed to each participating entity.
- Initiate conservation projects and partnerships.
- Seek to acquire funding.
- Agencies should seek to develop institutional capacities for necessary research, monitoring, evaluation, and data management.
- Report all strategy-related projects and changes in on-the-ground conditions to the Implementation Team.

6.5 Implementation progress to date

Over the two year time period that the Working Group has been meeting, and while the strategy document was being crafted, a number of specific actions have been taken to help reduce threats to the LPC and SDL. Some of these were stimulated by Working Group recommendations; others came about through independent processes. Of particular significance are the extensive biological research, habitat analysis, and mapping efforts currently underway or recently completed; deferral of new mineral leasing on NMSLO lands in occupied LPC habitat; acquisition of an extensive tract of prime LPC habitat by an NGO; protective BLM management of suitable and occupied LPC and SDL habitat; and initiation of planning for a LPC captive breeding facility at the WIPP site. These and other actions represent a significant first step toward reducing threats faced by the LPC and SDL.

A tabular summary of actions completed or in progress at the approval date of the Conservation Strategy, May 2005, is presented in Appendix A. The summary contains an entry for each numbered LPC conservation strategy from the Pathways in Chapter 4, and each SDL recommendation from Chapter 5. Such reporting is recommended on an annual basis, as discussed in section 6.3 above.

The Working Group concludes its Phase I efforts with the anticipation of lengthening annual reports of conservation progress and success in the coming years.

Literature Cited

- Ahlborn, G. G. 1980. Brood-rearing habitat and fall and winter movements of Lesser Prairie Chickens in eastern New Mexico. M.S. thesis. New Mexico State University, Las Cruces, New Mexico. 73 pages.
- Applegate, R. D. and T. Z. Riley. 1998. Lesser Prairie-Chicken management. *Rangelands* 20:13-15.
- Bailey, J. A., J. Klingel, and C. A. Davis. 2000. Status of nesting habitat for Lesser Prairie-Chicken in New Mexico. *Prairie Naturalist* 32:149-156.
- Bailey, J. A., and S. O. Williams, III. 2000. Status of the Lesser Prairie-Chicken in New Mexico, 1999. *Prairie Naturalist* 32:157-168.
- Bergerud, A. T. 1988. Population ecology of North American grouse. Pp. 578-685 *in* Adaptive strategies and population ecology of northern grouse (A. T. Bergerud and M. W. Gratson, eds.). University of Minnesota Press, Minneapolis.
- Bidwell, T., S. Fuhlendorf, B. Gillen, S. Harmon, R. Horton, R. Manes, R. Rodgers, S. Sherrod, D. Wolfe. 2001. Ecology and Management of the Lesser Prairie-Chicken. E-970. Oklahoma Cooperative Extension Service, Division of Agricultural Sciences and Natural Resources, Oklahoma State University.
- Bouzat, J. L., H. H. Cheng, H. A. Lewin, R. L. Westemeier, J. D. Brawn, and K. N. Paige. 1998. Genetic evaluation of a demographic bottleneck in the Greater Prairie-Chicken. *Conservation Biology* 12:836-843.
- Boyd, C. S. and T. G. Bidwell. 2001. Influence of prescribed fire on Lesser Prairie-Chicken habitat in shinnery oak communities in western Oklahoma. *Wildlife Society Bulletin* 29:938-947.
- Braun, C. E., K. Martin, T. E. Remington, and J. R. Young. 2004. North American grouse: issues and strategies for the 21st century. *Transactions of the North American Wildlife and Natural Resources Conference* 59:428-437.
- Braun, C. E., O. O. Oedekoven, and C. L. Aldridge. 2002. Oil and gas development in western North America: effects on sagebrush steppe avifauna with particular emphasis on Sage Grouse. *Transactions of the 67th North American Wildlife and Natural Resources Conference*. Wildlife Management Institute.
- Bury, R.B. and R.A. Luckenbach. 1983. Vehicular recreation in arid land dunes: biotic responses and management alternatives. In: Webb, R.H. and Wilshire, H.G. *Environmental Effects of Off-Road Vehicles: Impacts and Management in Arid Regions*: 207-21.

- Campbell, H. 1972. A population study of Lesser Prairie Chickens in New Mexico. *Journal of Wildlife Management* 36:689-699.
- Crawford, J. A. 1980. Status, problems and research needs of the Lesser Prairie-Chicken, pp. 1-7 *in* Proceedings Prairie Grouse Symposium (P. A. Vohs, Jr. and F. L. Knopf, eds.), Oklahoma State University, Stillwater, OK.
- Crawford, J. A. and E. G. Bolen. 1976. Effects of land use of Lesser Prairie-Chickens in Texas. *Journal of Wildlife Management* 40:96-104.
- Davis, C. A., T. Z. Riley, R. A. Smith, H. R. Suminski, and M. J. Wisdom. 1979. Habitat evaluation of Lesser Prairie Chickens in eastern Chaves County, New Mexico. New Mexico State University Agricultural Experiment Station, Las Cruces, New Mexico. 141 pages.
- Davis, C. A., T. Z. Riley, R. A. Smith, and M. J. Wisdom. 1980. Spring-summer foods of Lesser Prairie-Chickens in New Mexico. pp. 75-80 *in* Proceedings Prairie Grouse Symposium (P. A. Vohs, Jr. and F. L. Knopf, eds.), Oklahoma State University, Stillwater, OK.
- Davis, D. 2003. Summary of NMDGF surveys for active Lesser Prairie-Chicken leks: spring 2003. Unpubl. report. New Mexico Department of Game and Fish.
- Dick-Peddie, William A. 1993. New Mexico Vegetation: Past, Present and Future. University of New Mexico Press, Albuquerque, NM.
- Doerr, T. B. and F. S. Guthery. 1983. Effects of Tebuthiuron Lesser Prairie-Chicken habitat and foods. *Journal of Wildlife Management* 47:1138-1142.
- Fitzgerald, L. A., C. W. Painter, D. S. Sias, and H. L. Snell. 1997. The range, distribution and habitat of *Sceloporus arenicolus* in New Mexico. Final Report to New Mexico Department of Game and Fish. 31 pages.
- Fuhlendorf, S. D., A. J. W. Woodward, D. M. Leslie Jr., and J. S. Shackford. 2002. Multi-scale effects of habitat loss and fragmentation on Lesser Prairie-Chicken populations of the US Southern Great Plains. *Landscape Ecology* 17:617-628.
- Garrettson, P. R., R.C. Rohwer, L.A. Jones, and B.J. Mense. 1996. Predator management to benefit prairie-nesting ducks. Proceedings of the International Waterfowl Symposium 7:192-196.
- Garrison, G. A. and K. C. McDaniel. 1982. New Mexico brush inventory. Special Report No. 1. Las Cruces, NM: New State University and New Mexico Department of Agriculture. 28 pages.

- Giesen, K. M. 1998. Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) in The Birds of North America, No. 364 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Gorum, L. W., H. L. Snell, L. J. S. Pierce, and T. J. McBride. 1995. Results from the fourth year (1994) research on the effect of shinnery oak removal on the dune sagebrush lizard *Sceloporus arenicolus*, in New Mexico. Final Report to New Mexico Department of Game and Fish.
- Hunt, J. L. and T. L. Best. 2002. Investigation into the decline of populations of the Lesser Prairie-Chicken on lands administered by the Bureau of Land Management, Carlsbad Field Office. Annual Report.
- Jamison, B. E., J. A. Dechant, D. H. Johnson, L. D. Igl, C. M. Goldabe, and B. R. Euliss. 2002. Effects of management practices on grassland birds: Lesser Prairie-Chicken. Northern Prairie Wildlife Research Center, Jamestown, ND. 29 pages.
- Johnson, K. and H. Smith. 1999. Lesser Prairie-Chicken surveys on New Mexico Department of Game and Fish Prairie Chicken Management Areas. Report to New Mexico Department of Game and Fish, Santa Fe, NM. 27 pages.
- Knick, S. T., and J. T. Rotenberry. 2000. Ghosts of habitats past: contribution of landscape change to current habitats used by shrubland birds. *Ecology* 81:220-227.
- Leslie, D. M., Jr., J. S. Shackford, A. Woodward, S. Fuhlendorf, and C. B. Green. 1999. Landscape-level evaluation of the decline of the Lesser Prairie Chicken in Oklahoma, Texas, and New Mexico. Final Report AP-96-201W, Oklahoma Department of Wildlife Conservation, Oklahoma City, Oklahoma. 63 pages.
- Ligon, J. S. 1951. Prairie Chickens, highways and power lines. *The Conservationist: News and Views of the State Department of Game and Fish*, May 1951. Santa Fe, NM.
- Ligon, J. S. 1953. The Prairie Chicken survey. *The Conservationist: News and Views of the State Department of Game and Fish*, February 1953. Santa Fe, NM.
- Ligon, J. S. 1961. *New Mexico Birds and Where to Find Them*. University of New Mexico Press, Albuquerque, NM
- Litton, G., R. L. West, D. F. Dvorak, and G. T. Miller. 1994. The Lesser Prairie-Chicken and its Management in Texas. Texas Parks and Wildlife, Austin, TX. 22 pages.
- Lyon, A.G. and S.H. Anderson. 2003. Potential gas development impacts on sage grouse nest initiation and movement. *Wildlife Society Bulletin*. 31:486-491.

- Martin, B. H. 1990. Avian and vegetation research in the shinnery oak ecosystem of southeastern New Mexico. Master of Science theses, New Mexico State University, Las Cruces. 116 pages.
- Massey, M. 2001. Long-Range Plan for the Management of Lesser Prairie-Chickens in New Mexico 2002-2006. New Mexico Department of Game and Fish, Santa Fe, NM. 47 pages.
- Merchant, S. S. 1982. Habitat use, reproductive success, and survival of female Lesser Prairie Chickens in two years of contrasting weather. M.S. thesis. New Mexico State University, Las Cruces, New Mexico. 62 pages.
- Mote, K. D., R. D. Applegate, J. A. Bailey, K. M. Giesen, R. Horton, and J. L. Sheppard. 1999. Assessment and conservation strategy for the Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*). Kansas Department of Wildlife and Parks, Emporia, Kansas. 51 pages.
- Painter, C. W., D. S. Sias, L. A. Fitzgerald, L. L. S. Pierce, and H. L. Snell. 1999. Management Plan for the Sand Dune Lizard (*Sceloporus arenicolus*) in New Mexico. New Mexico Department of Game and Fish, Santa Fe, NM. 45 pages.
- Peterson, M. J., P. J. Ferro, M. N. Peterson, R. M. Sullivan, B. E. Toole and N. J. Silvey. 2002. Infectious disease survey of Lesser Prairie-Chickens in north Texas. *Journal of Wildlife Diseases* 38:834-838.
- Peterson, R. S. and C. S. Boyd. 1998. Ecology and Management of Sand Shinnery Communities: A Literature Review. USDA Forest Service General Technical Report RMRS-GTR-16. Rocky Mountain Research Station, Fort Collins, CO. 44 pages.
- Riley, T. Z., C. A. Davis. 1993. Vegetative characteristics of Lesser Prairie-Chicken brood foraging sites. *Prairie Naturalist* 25:243-248.
- Riley, T. Z., C. A. Davis, M. A. Candelaria, and H. R. Suminski. 1994. Lesser Prairie-Chicken movements and home ranges in New Mexico. *Prairie Naturalist* 26:183-186.
- Riley, T. Z., C. A. Davis, M. Ortiz, and M. J. Wisdom. 1992. Vegetative characteristics of successful and unsuccessful nests of Lesser Prairie-Chickens. *Journal of Wildlife Management* 56:381-385.
- Riley, T. Z., C. A. Davis, and R. A. Smith. 1993. Autumn-winter habitat use of Lesser Prairie-Chickens (*Tympanuchus pallidicinctus*). *Great Basin Naturalist* 53:409-411.
- Robel, R. J., J. N. Briggs, A. D. Dayton, and L. C. Hulbert. 1970. Relationships between visual obstruction measurements and the weight of grassland vegetation. *Journal of Range Management* 23:295-297.

- Robel, R. J., J. A. Harrington, Jr., C. A. Hagen, J. C. Pitman, and R. R. Reker. 2004. Effect of energy development and human activity on the use of sand sagebrush habitat by Lesser Prairie-Chickens in southwest Kansas. Transactions of the North American Wildlife and Natural Resources Conference 68: in press.
- Schroeder, M. A. and R. K. Baydack. 2001. Predation and the management of prairie grouse. Wildlife Society Bulletin 29:24-32.
- Sias, D. S. and H. L. Snell. 1998. The Sand Dune Lizard (*Sceloporus arenicolus*) and oil and gas development in southeastern New Mexico. Final Report of field studies 1995-1997. Final Report to New Mexico Department of Game and Fish. 27 pages.
- Smith, H., K. Johnson, and L. Delay. 1998. Survey of the Lesser Prairie-Chicken on Bureau of Land Management lands, Carlsbad Resource Area, NM 1998. Unpubl. report. New Mexico Natural Heritage Program, Dept. of Biology, University of New Mexico. 12 pages.
- Snell, H. L., L. W. Gorum, L. J. S. Pierce, and K. W. Ward. 1997. Results from the fifth year (1995) research on the effect of shinnery oak removal on populations of Sand Dune Lizards (*Sceloporus arenicolus*) in New Mexico. Final Report to New Mexico Department of Game and Fish. 13 pages.
- Snyder, W. A. 1967. Lesser Prairie-Chicken. New Mexico Wildlife Management. New Mexico Department of Game and Fish, Santa Fe, NM. 121-128.
- Taylor, M. A. and F. S. Guthery. 1980. Status, ecology and management of the Lesser Prairie-Chicken. USDA Forest Service General Technical Report RM-77. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 15 pages.
- U.S. Fish and Wildlife Service,. 1998. Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Species that are Candidates or Proposed for listing as Endangered or Threatened, Annual Notice of Findings on Recycled Petitions, and Annual Description of Progress on Listing Actions; Proposed Rule. Federal Register 50 CFR Part 17 63: 31400-31406.
- U. S. Fish and Wildlife Service. 2001. Review of Plant and Animal Species That Are Candidates or Proposed for Listing as Endangered or Threatened, Annual Notice of Findings on Recycled Petitions, and Annual Description of Progress on Listing Actions; Proposed Rule. Federal Register 66: FR 54807 54832.
- U.S. Fish and Wildlife Service. 2002. Candidate assessment and listing priority assignment form: Lesser Prairie-Chicken. FWS Ecological Services, Tulsa, OK.
- U. S. Fish and Wildlife Service. 2004. Candidate assessment and listing priority assignment form: Sand Dune Lizard. FWS Ecological Services, Albuquerque, NM.

- Van Den Bussche, R. A., S. R. Hoofer, D. A. Wiedenfeld, D. H. Wolfe, and S. K. Sherrod. 2003. Genetic variation within and among fragmented populations of Lesser Prairie-Chickens (*Tympanuchus pallidicinctus*). *Molecular Ecology* 12:675-683.
- Westemeier, R. L., J. D. Brawn, S. A. Simpson, T. L. Esker, R. W. Jansen, J. W. Walk, E. L. Kershner, J. L. Bouzat, and K. N. Paige. 1998. Tracking the long-term decline and recovery of an isolated population. *Science* 282:1695-1698.
- Wildlife Habitat Management Institute (WHMI). 1999. Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*). Fish and Wildlife Management Leaflet No. 6. Natural Resources Conservation Service, Wildlife Habitat Management Institute, Madison, Mississippi. 8 pages.
- Wilson, D. L. 1982. Nesting habitat of Lesser Prairie Chickens in Roosevelt and Lea counties, New Mexico. M.S. thesis. New Mexico State University, Las Cruces, New Mexico. 36 pages.
- Wisdom, M. J. and L. S. Mills. 1997. Sensitivity analysis to guide population recovery: Prairie-Chickens as an example. *Journal of Wildlife Management* 61:302-312
- Wolfe DH, Patten MA (2003) Factors affecting nesting success and mortality of Lesser Prairie-Chickens in New Mexico. Submitted to New Mexico Department of Game and Fish, Santa Fe. 7 pp.
- Wolfe, D. H., M. A. Patten, and S. K. Sherrod. 2003. Factors affecting nesting success and mortality of Lesser Prairie-Chickens in Oklahoma. Final Report. G. M. Sutton Avian Research Center.
- Woodward, A. J., S. D. Fuhlendorf, D. M. Leslie, Jr., and J. Shackford. 2001. Influence of landscape composition and change on Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) Populations. *American Midland Naturalist* 145:261-27

Appendices

Appendix A: Actions Completed or Underway

Progress report on LPC conservation activities, 2003 - 2005

Pathway/ Strategy	Strategy Description	Action Item/Parties Involved	Status of Action
1.1	Conservative grazing management with compensation for ranchers	<p>50% voluntary reductions in livestock use on BLM Core Management Area (CMA) allotments of the Roswell Field Office (RFO)</p> <p>BLM Carlsbad Field Office (CFO) working with permit holders on 5 allotments to develop measures that include rest rotation and mesquite control</p> <p>NRCS Portales Office EQIP funding for LPC habitat improvement through deferred grazing and other measures:</p> <p>NRCS Portales Field Office Wildlife Habitat Improvement funding for playas in Curry, Roosevelt and Lea counties. Extra points for landowners with LPCs within 2 miles of playa.</p>	<p>One allotment in 2004</p> <p>Initiated in FY2005</p> <p>2003: 3 contracts, 46,380 acres, \$259,160 2004: 2 contracts, 9,323 acres, \$69,871 2005: 1 contract, 6593 acres, \$54,598</p> <p>Initiated in 2005. 1 contract, 372 acres, \$22,770</p>
1.2	Enhanced CRP	Discussions ongoing	Ongoing

Pathway/ Strategy	Strategy Description	Action Item/Parties Involved	Status of Action
1.3	Mesquite control	<p>BLM CFO-Mesquite control in 5 allotments in LPC habitats</p> <p>FWS Private Stewardship Grant Program partnership project with Grasslans Charitable Foundation and Phalarope Consulting for mesquite control and planting of native grasses</p> <p>FWS Partners Program mesquite and cholla control projects with NMSLO and private landowners</p> <p>NRCS EQIP projects, see above</p>	<p>Initiated FY05</p> <p>\$153,000 grant awarded 2005</p> <p>Completed or ongoing</p>
1.4	Shinnery oak management	<p>BLM—Interseeding desirable native grasses in shinnery oak habitats</p> <p>Playa Lakes Joint Venture and The Nature Conservancy grant to use patch burning to try to increase dominance of native grasses</p>	<p>Ongoing</p> <p>\$40,000 grant awarded</p>

Pathway/ Strategy	Strategy Description	Action Item/Parties Involved	Status of Action
2.1	Guidelines for new mineral leasing	<p>NMSLO deferred leasing (for unleased areas) in occupied LPC habitat</p> <p>BLM deferred mineral leasing in LPC/SDL habitat in CMA</p> <p>BLM interim management guidelines to protect LPC and SDL habitat during the Resource Management Plan Amendment process</p> <p>Baseline habitat suitability map for the PPA</p> <p>Statistical review of lek monitoring to detect trends</p> <p>Suitability analysis of 17 Carlsbad areas</p>	<p>Established and ongoing; to be reviewed in 2007</p> <p>Ongoing</p> <p>Established 2004 and ongoing until RMPA is complete</p> <p>Complete FY2005</p> <p>Initiated FY2005</p> <p>Initiated FY2005</p>
2.2	Minimizing impacts of new and ongoing energy development	<p>BLM requiring Plans of Development (PODs) in key habitat areas to minimize surface disturbance and fragmentation. Completed 18 PODs in CFO and 3 PODs in RFO to minimize surface disturbance for LPC and SDL</p> <p>BLM and industry working to implement improved reclamation procedures on current wells, roads, and rights-of-way</p>	<p>Initiated FY2004 and ongoing in FY2005</p> <p>Ongoing</p>
2.3	Coordinate restoration and reclamation of previously developed areas	BLM program to reclaim Pre-NEPA roads, well pads, rights-of-way, etc. FY04 accomplishments include reclamation of approximately 15 well pads and 3 miles of road. FY05 pursuing coordinated efforts with NRCS for reclamation and vegetative manipulation projects	Initiated FY2004 and ongoing in FY2005

Pathway/ Strategy	Strategy Description	Action Item/Parties Involved	Status of Action
3.1	BLM/SLO exchanges	BLM RFO has forwarded listing of State Land parcels for possible exchange to the BLM State Director	Initiated FY2005
3.2	Establishing LPC reserves	The Nature Conservancy purchase of 18,5000-acre Creamer Ranch property near Milnesand, in area of prime habitat and high LPC density	Complete in 2004
3.3	Comprehensive Management of PCAs	BLM developed alternatives for managing Federal minerals in PCAs as part of its regional Resource management Plan Amendment (RMPA)	Initiated FY2005
3.4	Develop CCAAs	Meetings with agency representatives to discuss development of CCAA in association with future LPC reintroduction at Brininstool Ranch Discussions with landowners and NMSLO to develop CCAAs regionally on non-federal lands Agency discussions of mechanism to provide CCAA-equivalent “assurances” on federal allotments and leases	Initiated FY2005 Initiated and ongoing Initiated and ongoing
4.1	Manage and restore potential habitat in SE NM (IPA)	Biological inventory and habitat assessment of IPA	Initiated and ongoing
4.2	Captive propagation program	Planning for LPC captive propagation facility at WIPP Brininstool Ranch identified as future LPC reintroduction site, with landowner and agency support	Initiated and ongoing Site ID complete, discussions ongoing
5.1	Predator control	Reduce LPC mortality by controlling predators	Ongoing

Pathway/ Strategy	Strategy Description	Action Item/Parties Involved	Status of Action
5.2	Road closures and OHV management	<p>Unless otherwise designated, ORV use limited to designated roads or trails in the BLM Roswell Field Office</p> <p>Road designations in BLM Roswell and Carlsbad Field Offices are being evaluated in ongoing Resource Management Plan Amendment</p>	<p>Ongoing</p> <p>Initiated FY05</p>
5.3	Reduce unlawful hunting	NMDGF education efforts	Ongoing
5.4	Plant grain crops in select areas		
6	Research	<p>Maintained or increased LPC roadside surveys by NMDGF, BLM, NMSLO</p> <p>BLM Carlsbad Field Office tested use of helicopter to locate LPC over approximately 100,000 acres in 2 days</p> <p>BLM habitat monitoring in LPC nesting and brooding areas</p> <p>Sutton Avian Research Center continuing research on LPC habitat and nesting</p> <p>Auburn University and BLM research on ways to establish new lek sites within LPC historic range</p>	<p>Ongoing</p> <p>Initiated in FY2005</p> <p>Ongoing</p> <p>Ongoing</p> <p>Ongoing</p>

Pathway/ Strategy	Strategy Description	Action Item/Parties Involved	Status of Action
6 (cont.)	Research	NMDGF, FWS, and Grasslands Charitable Foundation research trapping, tracking and monitoring LPCs to determine habitat use on Milnesand Prairie Preserve (Creamer Ranch)	2004-present
		NMDGF, Grasslands Charitable Foundation and Charles Dixon conducting studies of LPC response to herbicide treatment of shinnery oak on private lands	2000-present
		Texas Tech University graduate student project on nesting response to herbicide treatment	Ongoing
7	Education and Outreach	High Plains Prairie-Chicken Festival in Milnesand	Annual and Ongoing
		Outreach presentations by Tish McDaniel / Phalarope Consulting to Soil and Water Conservation Districts, schools and other groups	2003 – present
		Presentations to over 100 students about prairie grassland conservation issues, including SDL and LPC, at the Living Desert State Park	FY2005
		Ongoing communication between agency and oil and gas representatives about need and opportunities for LPC and SDL conservation	Ongoing
		Agency discussions with the Eddy County Board on LPC and SDL issues and conservation strategies	FY2005
		Agency discussions with rural electric cooperatives on SDL and LPC issues	FY2005

Pathway/ Strategy	Strategy Description	Action Item/Parties Involved	Status of Action
8	Coordination of Conservation Efforts	<p>BLM Resource Management Plan Amendment addressing special status species with focus on Sand Dune Lizard and Lesser Prairie-Chicken</p> <p>Planning under way to establish New Mexico Prairie Conservation Initiative, housed at the Center for Excellence in Carlsbad, NM</p> <p>Partnership projects between agencies and NGOs</p> <p>Implementation Team established to advance goals and objectives of the NM LPC/SDL Conservation Strategy</p>	<p>Under development 2005</p> <p>Launched in 2004 and ongoing</p> <p>Various, completed and ongoing, See examples above.</p> <p>Established May 2005</p>
9	Funding	<p>EQIP funding available for improvements on federal lands in New Mexico</p> <p>Implementation Team exploring options for increased state and federal funding for conservation efforts</p>	<p>Beginning 2005</p> <p>Beginning 2005 and ongoing</p>

Progress report on SDL conservation activities, 2003 - 2005

Strategy Item	Strategy Description	Action Item/Parties Involved	Status of Action
1.	Discontinue Tebuthiuron spraying w/in 500m of occupied/suitable habitat	Tebuthiuron treatments around occupied/suitable SDL habitat are not being conducted on BLM administered lands	Ongoing
2.	Maintain dispersal corridors of 500m wide		

Strategy Item	Strategy Description	Action Item/Parties Involved	Status of Action
3.	Place well pads >100m from dunes	BLM is working with industry to locate wells outside of dune complexes	Ongoing
4.	Manage well density to <13/mi ²		
5.	Minimize well pad size and carry out site reclamation	<p>BLM program to reclaim Pre-NEPA roads, well pads, rights-of-way, etc. FY04 accomplishments include reclamation of approximately 15 well pads and 3 miles of road.</p> <p>BLM and industry working to implement improved reclamation procedures on current wells, roads, and rights-of-way</p>	<p>Initiated FY04 and ongoing FY05</p> <p>Ongoing</p>
6.	Limit ORV use in occupied habitat	<p>Unless otherwise designated, ORV use limited to designated roads or trails in the BLM Roswell Field Office</p> <p>Road designations in BLM Roswell and Carlsbad Field Offices are being evaluated in the Resource Management Plan Amendment</p>	<p>Ongoing</p> <p>Initiated FY2005</p>
7.	Minimize impacts of seismic exploration by thumper trucks	BLM cooperating with seismic companies to develop and implement guidelines to avoid dunal complexes that are suitable and/or occupied SDL habitat	Ongoing

Strategy Item	Strategy Description	Action Item/Parties Involved	Status of Action
8.	Develop public awareness program	<p>Presentations to over 100 students about prairie grassland conservation issues, including SDL and LPC, at the Living Desert State Park</p> <p>Ongoing communication between agency and oil and gas representatives about need and opportunities for LPC and SDL conservation</p> <p>Agency discussions with the Eddy County Board on LPC and SDL issues and conservation strategies</p> <p>Agency discussions with regional electric cooperatives on SDL and LPC issues</p>	<p>FY2005</p> <p>Ongoing</p> <p>FY2005</p> <p>FY2005</p>
9.	Limit pollution by inspecting pipeline/maintaining wells	Well inspections on BLM-administered leases	Ongoing
10.	Research	<p>NMDGF and Texas A&M SDL breeding and dispersal studies</p> <p>Landscape analysis and habitat suitability studies by NMDGF, BLM, and Texas A&M</p>	<p>Ongoing</p> <p>Ongoing</p>
11.	Land Use Planning	<p>BLM Resource Management Plan Amendment addressing special status species with focus on Sand Dune Lizard and Lesser Prairie-Chicken</p> <p>Planning under way to establish New Mexico Prairie Conservation Initiative, housed at the Center for Excellence in Carlsbad, NM</p> <p>Implementation Team established to advance goals and objectives of the NM LPC/SDL Conservation Strategy</p>	<p>Under development 2005</p> <p>Launched in 2004 and ongoing</p> <p>Established May 2005</p>

(This page intentionally left blank)

Appendix B: Description of suitable habitat for the sand dune lizard

The following description of suitable habitat was developed by a technical subgroup in order to clarify recommendations affecting sand dune lizard suitable habitats.

Suitable habitat is any mosaic of shinnery oak dunal habitat types within 20 km of an occupied site measured from the outer edge of that contiguous habitat site.

The habitat type of primary importance consists of shinnery dune complexes that contain blowouts. Open sand dunes and shinnery oak flats provide habitat to a lesser extent for sand dune lizards.

Brief descriptions of these habitat types include the following (taken from Fitzgerald et al. 1997).

- Shinnery dunes are active sand dune complexes dominated by shinnery oak and characterized by the presence of open blowouts of varying sizes. The blowouts have grasses and other plants growing in them at varying densities.
- Open sand dunes are large active dunes with steep slopes that contain open expanses of bare sand with limited vegetation.
- Shinnery flats are sites with sandy soils dominated by shinnery oak, but have relatively little topographic relief. Several species of grasses and forbs are generally associated with these sites.

Literature Cited:

Fitzgerald, L.A., C.W. Painter, D.S. Sais, and H.L. Snell. 1997. The range, distribution and habitat of *Sceloporus arenicolus* in New Mexico. Final Report to New Mexico Department of Game and Fish. Contract #80-516.6-01. 31 pp.

Appendix C: Working Group Members and Committees

Working Group Representatives and Participants

O = Organizing Committee

T = Technical Committee

D = Document Committee

(The following individuals participated significantly in Working Group negotiations, though not all were present for the entire process. Additional individuals who only attended one or two meetings are not listed.)

Federal Agencies

U.S. Fish and Wildlife Service (FWS)

Brian Hanson (O, D)

Jennifer Parody (D)

Federal Bureau of Land Management (BLM)

Ed Roberson

Leslie Theiss

Tim Kreager

Paul Sawyer (O, D)

Rand French (T)

Steve Belinda (T)

Steve Bird (T)

U.S. Department of Energy (DOE)

Doug Lynn (WIPP)

U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS)

Dave Seery

State Agencies

New Mexico Department of Game and Fish (NMDGF)

Bill Dunn (O, D)

Dawn Davis

New Mexico State Land Office (NMSLO)

David Coss (O)
Jennifer Parody (D)
Shawn Knox
Natalie Runyan

New Mexico Department of Agriculture (NMDA)

Bud Starnes

Ranchers/Livestock Growers

John Clemmons
Lewis Derrick (O)
George Hay
Bill Marley
Mark Marley
Rick Pearce

Oil and Gas Industry

Dan Girand (O)	Mack Energy Corporation
Jeff Harvard	Harvard Petroleum, Independent Petroleum Association of NM
Raye Miller	Marbob Energy Corporation, New Mexico Oil and Gas Association
Chuck Moran	Yates Petroleum Corporation, Independent Petroleum Association of NM
Bob Manthei	BP Energy Company, New Mexico Oil and Gas Association

Conservation and Environmental Interests

James Bailey (O, D)	Independent biologist, representing several groups
Terry Riley (T)	Wildlife Management Institute, Teddy Roosevelt Conservation Partnership
Tom Jervis	Central New Mexico Audubon Society
David Henderson	Central New Mexico Audubon Society
Robert Findling	The Nature Conservancy
Barbara Johnson	Quivira Coalition

Technical Advisors

Kris Johnson(T)	New Mexico Natural Heritage Program, Univ. of New Mexico
Tish McDaniel (T)	Independent biologist, Phalarope Consulting
Roger Peterson (T)	Independent biologist
Len Carpenter (T)	Wildlife Management Institute
Charlie Painter (T)	New Mexico Department of Game and Fish
Lee Fitzgerald (T)	Texas A&M University
Stephanie Harmon (T)	U.S. Fish and Wildlife Service

Facilitation Team

Toby Herzlich
Ric Richardson

Document Writer

Scott Norris

GIS Support

Greg Homan	BLM
Natalie Runyan	NMSLO
Terri Neville	NM Natural Heritage Program

Proposed Implementation Team Membership as of May 2005

Agencies

Paul Sawyer, BLM
Jennifer Parody, FWS
Marcus Miller, NRCS
David Coss, NMSLO
Bill Dunn, NMDGF
Bud Starnes, NMDA
Ned Farquhar, Office of the Governor

Ranching

Lewis Derrick
Mark Marley

Oil and Gas

Jeff Harvard
Dan Girand

Conservation

Tish McDaniel, The Nature Conservancy
Terry Riley, Wildlife Management Institute
Kris Johnson, New Mexico Natural Heritage
Program, University of New Mexico

Appendix D: Maps

(See fold-outs attached)

Map 1. Planning Area for the Lesser Prairie-Chicken – Sand Dune Lizard Conservation Strategy

Map 2. Lesser Prairie-Chicken and Sand Dune Lizard Distribution

Map 3. Lesser Prairie-Chicken Management Regions

Map 4. Habitat Categories within the Primary Population Area